DRAFT IMPORT RISK ANALYSIS

FOR THE IMPORTATION OF

FRESH TABLE GRAPES [*Vitis vinifera* L.]

FROM CALIFORNIA (USA)

MARCH 1999

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Acknowledgments

This draft IRA has been prepared by the Plant Quarantine Policy Branch with assistance from the Horticulture Program, Quarantine Export and Operations Division.

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1. INTRODUCTION

In accordance with the International Standards for Phytosanitary Measures (ISPM) - Principles of Plant Quarantine as related to International Trade ISPM No.1 FAO, 1993; Guidelines for Pest Risk Analysis ISPM No. 2 FAO, 1993, and other standards being developed by the Secretariat of the International Plant Protection Convention (IPPC) of the Food and Agriculture Organization (FAO), for any application to import a new commodity from a new source, the Australian Quarantine and Inspection Service (AQIS) conducts an Import Risk Analysis (IRA) on the phytosanitary risk to Australia posed by a proposed importation.

The primary purpose of an IRA is to identify quarantine pests* potentially associated with the commodity, to analyse their risk of entry, establishment and spread in Australia, and to evaluate management options to mitigate such risks. Having identified the quarantine pests associated with the importation, AQIS will consider whether management options are available to mitigate the risks of entry by those pests and of their subsequent establishment and spread. A draft IRA, based on the best available scientific information, is documented for consultation with interested parties and to ensure that the decision-making process is transparent and technically justifiable.

This draft report outlines the risk analysis of the proposed importation of fresh table grapes (*Vitis vinifera* L.) from the state of California, in the United States of America. It summarises information from the Pest Risk Analysis (PRA) paper entitled "Risk Analysis of the Importation of Fresh Table Grapes (*Vitis vinifera* L.) from California, USA". This paper includes specific details of pests, both quarantine and non-quarantine, associated with table grapes from California.

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* **FAO definition of quarantine pest [FAO Glossary of Phytosanitary Terms (FAO, 1997)]** A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled.

2. PURPOSE

To present a risk assessment and management of pests determined by the PRA to be of quarantine concern to Australia and to provide a framework to consult with stakeholders to identify risk management options on proposed importation of fresh table grapes (*Vitis vinifera* L.) from California, the United States of America.

3. BACKGROUND

3.1. History of the access request

AQIS received an application from the United States of America in 1990 seeking access for table grapes from California into Australia. Information on pests and diseases recorded to be associated with grapes in California was subsequently provided to AQIS.

A preliminary assessment of the risk of importing fresh table grapes from California was completed by AQIS in 1990. The major phytosanitary risks associated with table grapes were identifed and the results of this preliminary assessment were provided to the Animal and Plant Health Inspection Service (APHIS) to enable the development of a fumigation treatment with methyl bromide. APHIS later proposed a controlled atmosphere (CA) treatment of carbon dioxide and oxygen in lieu of fumigation with methyl bromide.

This was a novel treatment, so AQIS requested that APHIS conduct research to evaluate its efficacy as an in transit disinfestation treatment. Preliminary assessment of the research data from the controlled atmosphere treatment indicated some inadequacies in the experimental protocol and its efficacy. The Commonwealth Scientific and Industrial Research Organisation (CSIRO) was contracted to review the results of the CA treatment and suggested that further research was required. As this would take several years, APHIS asked AQIS to re-consider access for Californian table grapes, using methyl bromide fumigation treatment. The efficacy of post-harvest fumigation against pests of quarantine concern to Australia is considered in this draft IRA.

3.2. Australian grape industry

Grapes (*Vitis vinifera* L.) are produced commercially in all States and Territories of Australia except for the Northern Territory. The Australian grape season generally falls between October to April.

3.2.1. Table grape industry

Table grapes are produced commercially in most States and Territories of Australia except for Tasmania and the Australian Capital Territory. Approximately 80% of production occurs in Victoria and New South Wales (60% and 20% respectively). The largest production is in the Sunraysia and mid-Murray regions of Victoria, followed by the Riverina, Menindee and Bourke areas of New South

Wales. The industry is expanding rapidly in parts of Queensland, South Australia and Western Australia. Production in the other areas remains relatively static.

The Australian Bureau of Statistics (ABS) reports that table grape production increased steadily from around 50,000 tonnes in 1994 to around 63,000 tonnes in 1997. The number of commercial table grape growers in Australia is unknown, but is estimated to be between 800 to 1000.

The domestic market absorbs between 60 - 80% of production each year with Sydney and Melbourne the major markets. Export is an important part of the industry as it provides economic returns for producers who achieve good quality product. Exports of table grapes have risen from 8693 tonnes in the mid 1980s, to around 27,000 tonnes in 1997-98. Important export markets include Hong Kong, Indonesia, Malaysia, New Zealand, Singapore and the United Kingdom.

3.2.2. Table grape varieties in commercial production

Red Globe and Sugraone varieties have been introduced into Australia from California in the last decade. The variety Menindee Seedless is thought to be similar to the Sugraone or Superior Seedless from California. The 1994/95 production was predominantly based on Red Globe, Sugraone/Menindee Seedless, Thompson Seedless, and, to a lesser extent, Calmeria and Red Emperor. The popularity of the sultana grape, Thompson Seedless, has recently waned with growers, mainly because of the high cost of production compared with other varieties.

CSIRO released the first seedless black table grape, Marroo Seedless, in Australia in 1986 but it has not been widely adopted. A number of other varieties from America, Israel and South Africa are being evaluated for possible commercial production in Australia.

3.2.3. Wine grape industry

Wine grapes are produced commercially in all states and territories of Australia except for the Northern Territory. Approximately 50% of grapes crushed for wine come from South Australia, with New South Wales and Victoria contributing 26% and 22% respectively. The largest production areas are in the Murray Valley, specifically the Riverland region of South Australia, Sunraysia in Victoria and the Murrumbidgee Irrigation Area of New South Wales. The industry is expanding rapidly in all production areas of Australia, particularly in South Australia and New South Wales.

The ABS reports that the area of vines planted for wine production increased from 661 282 ha in 1994 to 856 074 ha in 1998. The number of wine grape growers in Australia is unknown, but best estimates give figures of between 4,000 and 4,500.

The domestic market uses approximately 65% of wine produced each year. Export markets have increased markedly in the past decade, from 10.8 million litres in 1985/86 to 130.3 million litres in 1995/96, valued at $471.3 million. The major markets for Australian wine are the United Kingdom, New Zealand, United States of America, Canada and Japan.

3.2.4. Wine grape varieties in commercial production

The ABS reported that red grape varieties covered 47,675 hectares and white grape varieties covered 50,764 hectares at harvest 1998. The current main varieties of red wine grapes are Cabernet Sauvignon and Shiraz. The current main varieties of white wine grapes are Chardonnay and Semillon.

3.2.5. Dried grapes industry

The dried grapes industry in Australia is concentrated in the Sunraysia, Riverina and Riverland regions of New South Wales, Victoria and South Australia.

The ABS reports that the area planted of grapes for drying decreased from 212,870 ha in 1994 to 175, 364 ha in 1998. However the production of grapes for drying increased 29% to 175,364 tonnes and this represents 16% of the total grapes produced. Currants and raisins were almost all consumed by the domestic market, with an average 60% of the sultana crop exported. Although the levels of exports tend to fluctuate yearly, the Australian dried grape export market was worth $29.8 million in 1998. Major destinations for dried grapes from Australia are Canada, the United Kingdom and Germany.

3.2.6. Drying grape varieties in commercial production

Major red grape varieties grown in Australia for drying are Currants while Sultana, Muscat Gordo Blanco and Waltham Cross are the major white grape varieties.

3.2.7. Californian table grape industry

The Californian table grape season generally begins in May and may extend through to late February, depending on environmental conditions. The earliest season table grapes are harvested from the Coachella Valley. During spring, the table grape crop ripens throughout the San Joaquin Valley and finally in the Central Valley near Madera. During the off season, California imports table grapes from Chile to supply its domestic market.

Californian table grapes are based on a wide range of varieties, each with its own "season", taste and texture. The major green grape varieties include Calmeria, Perlette, Sugraone and Thompson Seedless. Major red grape varieties are Christmas Rose, Crimson Seedless, Emperatriz, Emperor, Flame Seedless, Premium Red, Red Globe, Rouge and Ruby Seedless. Major varieties of blue-black grapes include Beauty Seedless, Exotic, Fantasy Seedless, Marroo Seedless, Niabell and Ribier.

4. BIOLOGICAL ASSESSMENT OF PESTS AND DISEASES OF CONCERN TO AUSTRALIA CONSIDERED TO HAVE A SIGNIFICANT RISK OF ENTRY, ESTABLISHMENT AND SPREAD

The following pests and diseases which occur on grape vine (*Vitis vinifera*) have been assessed to have significant risk of entry on table grapes from California. All pest/disease species listed below are deemed to be of quarantine significance in accordance with the FAO definition of a quarantine pest.

Arthropods

4.1.1. Species: *Amyelois transitella* (Walker, 1863) [Lepidoptera: Pyralidae]

Synonyms: *Paramyelois transitella* (Walker, 1863); *Emporia cassiae* Dyar, 1917; *Myelois duplipunctella* Bagenot, 1857; *Myelois notatalis* Walker, 1863*; Myelois solitella* Zeller, 1881*; Myelois venipars* Dyar, 1914

Common name(s): navel orangeworm

Hosts: *Acacia farnesiana* (mimosa bush), *Brachychiton* sp. (bottle tree), *Carya illinoensis* (pecan), *Ceratonia siliqua* (locust), *Citrus* sp., *Citrus limon* (lemon), *Citrus x paradisi* (grapefruit), *Citrus sinensis* (orange), *Coffea* sp. (coffee), *Cydonia oblonga* (quince), *Eriobotrya japonica* (loquat), *Ficus* sp. (fig), *Forchhammeria* sp., *Genipa americana* (marmelade-box), *Gleditsia triacanthos* (honey locust), *Heteromeles arbutifolia* (toyan berry), *Juglans regia* (walnut), *Malus pumila* (apple), *Phoenix dactylifera* (date), *Pistacia vera* (pistachio), *Pithecellobium flexicaule* (Texas ebony), *Prunus armeniaca* (apricot), *Prunus domestica* (plum), *Prunus dulcis* (almond), *Prunus* peach), *Punica granatum* (pomegranate), *Pyrus communis* (pear), *Vitis vinifera* (grape vine), *Yucca* sp. (beargrass), *Ziziphus* sp. (jujube)

Plant part affected: damaged, overripe and dried fruits and nuts.

Distribution: Brazil; Costa Rica; Italy; Mexico; United States of America (Arizona, California, Florida, Georgia, Oklahoma, Texas, Washington).

Biology:

Life history:

The adult navel orangeworm moth is approximately 15 mm long and has short, snoutlike projections from the front of the head. It is greyish brown in color with irregular silver and

dark markings on the wings. The damage is caused by the larvae feeding in the fruit and larvae are most often found in the dried and decaying berries of clusters. The larvae vary in color from white to a deep pink, and are up to 20 mm in length when mature. Eggs are white when laid, but turn pink within a few days. Eggs are usually laid in fissures on the ripening fruit or under bud scales.

Entry potential: Low, larvae are most often present in fruit which would not be packed due to quality issues.

Establishment potential: Moderate, if hosts are available.

Spread potential: High, the adults are agile flyers that are capable of rapid and strong direct flight at heights of only a few metres above the ground as well as at canopy height. Adults can travel distances of up to 375–425 m, but the maximum flight range of is not known.

Economic importance: This can be an important pest in a range of horticultural fruits and nuts. It is a serious economic pest of almonds and walnuts in California, USA. In 1973-76 the average loss of almonds due to this species was $10 million, and in 1977 the loss was $20 million.

Quarantine status: Quarantine pest.

Estimated risk: Moderate.

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3. Flaherty, D. L., Christensen, L. P., Lanini, W. T., Marois, J. J., Phillips, P. A., Wilson, L. T. (eds) (1992). Grape pest management, second edition. Division of Agriculture and Natural Resources : University of California, Berkeley, 400 pp.

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4.1.2. Species: *Argyrotaenia citrana* (Fernald, 1889) [Lepidoptera: Tortricidae]

Synonyms: *Tortrix citrana* Fernald, 1889; *Argyrotaenia citrana* (Fernald); *Eulia citrana* (Fernald); *Cacoecia franciscana* Fernald; *Tortrix franciscana* (Fernald); *Argyrotaenia franciscana* (Fernald); *Eulia franciscana* (Fernald); *Tortrix purata* Meyrick, 1930; *Argyrotaenia purata* (Meyrick).

Common name(s): apple skinworm; orange tortrix.

Hosts: *Abelia x grandiflora*, *Acacia* spp. (wattle), *Actinidia chinensis* (kiwi fruit), *Aquilegia* sp. (columbine), *Aralia* sp., *Asparagus densiflorus* (asparagus fern), *Asparagus setaceus* (climbing asparagus fern), *Baccharis pilularis* (chaparral broom, dwarf chaparral-broom, dwarf coyote bush), *Begonia* sp. (begonia), *Brassica* sp. (brassica), *Chenopodium murale* (nettle-leaved goosefoot), *Cineraria* sp., *Citrus* sp., *Citrus limon* (lemon), *Citrus x limonia* (lemandarin, Mandarin lime, Rangpur lime), *Citrus x paradisi* (grapefruit), *Citrus sinensis* (navel orange, orange, sweet orange, Valencia orange), *Coix lachryma-jobi* (Job's tears), *Eriodictyon* sp., *Erodium* sp. (heronsbill, stork's- bill), *Eucalyptus* sp. (eucalypt, gum tree), *Euonymus* sp. (burning bush, spindle tree, strawberry bush), ferns, *Geranium* sp. (cranesbill), *Juglans californica* (California walnut, wild walnut), *Juglans regia* (English walnut, Italian walnut, Madeira nut, Persian walnut, walnut), *Lactuca sativa* (common lettuce, garden lettuce, lettuce), *Lantana* sp. (shrub verbena, wild lantana), *Lavandula* sp. (lavender), *Leucanthemum x superbum* (shasta daisy), *Lotus* sp. (trefoil), *Malus pumila* (apple, paradise apple), *Nerium oleander* (oleander), *Pelargonium* sp., *Pentas* sp., *Persea americana* (avocado), *Pinus radiata* (Himalayan pine, Monterey pine, radiata pine), *Pittosporum eugenioides* (lemonwood, tarata), *Prunus armeniaca* (apricot), *Prunus avium* (sweet cherry, wild cherry), *Prunus domestica* (plum, prune, wild plum), *Pyrus communis* (pear), *Quercus agrifolia* (California live oak), *Rosa* sp. (rose), *Rubus* spp. (blackberry, bramble, caneberry, dewberry, loganberry, raspberry), *Rubus flagellaris* x *Rubus loganobaccus* (youngberry), *Rubus idaeus* (raspberry), *Rubus idaeus* var. *strigosus* (American raspberry), *Rubus laciniatus* (cut-leaf blackberry), *Rubus loganobaccus* (boysenberry, loganberry), *Rubus ursinus* (California berry, California blackberry, mammoth blackberry, marionberry, Pacific berry, western blackberry), *Salix* sp. (willow), *Schinus* sp., *Solanum pseudocapsicum* (christmas cherry, Jerusalem cherry, winter cherry), *Solidago californica* (goldenrod), *Tradescantia fluminensis* (wandering Jew), *Urtica* sp. (nettle), *Urtica urens* (stinging nettle), *Vaccinium* sp. (bilberry, blueberry, cowberry, cranberry, sparkleberry), *Vitis vinifera* (grape vine).

Larvae are often found in weeds such as *Brassica* spp. (mustard), *Lupinus* spp. (lupins), *Malva* spp. (mallow), *Papaver* spp. (California poppy) and *Rumex* spp. (curly dock). Larvae also attack vineyard cover crops including *Avena sativa* (oats) and *Hordeum vulgare* (barley).

Plant part affected: buds; fruit; leaves; young shoots.

Distribution: British Colombia, Mexico; United States of America (Arizona, California, ?Florida, Oregon, Washington).

Biology:

Life history:

A. citrana is multivoltine and reproduces without undergoing a winter diapause. The nocturnal female moths lay egg clusters on any smooth plant surfaces, such as upper leaf surfaces, stems, canes or fruit. The orange-brown moth (13 mm long) lays an average of nine egg masses, with 33 eggs each. Eggs are flat, oval and cream-colored.

The newly hatched larvae are 2 mm long, and grow to be 13 mm long. *A. citrana* larvae form protective webbings in leaves and fruit clusters, and feed on the fruit. The damage caused by *A. citrana* larvae feeding in fruit clusters facilitates the entry of organisms that induce rots. In addition, the overwintering larvae may attack emerging grape buds or young shoots. This injury may be confused with damage by cutworms, however, webbing points are indicative of *A. citrana* larval damage. The pupae are about 13 mm long. Pupation generally takes place in the host (webbing) where the larvae have been feeding.

All developmental stages of *A. citrana* are present throughout the year. The overlapping generations make it difficult to estimate the size of any one generation. Investigations in central coast areas of the USA have shown that *A. citrana* produce three generations during the year, from late April to early May, in July and from October to November.

The orange tortrix has adapted to the cooler coastal regions of the USA. Laboratory observations have shown that the developmental temperature ranges from 6–32°C, with the optimum at 25.6°C.

Entry potential: Moderate, feeds in fruit clusters but generally produces webbing which increases the chance of detection.

Establishment potential: High, has a broad range of hosts and developmental temperatures.

Spread potential: Medium, adults are mobile flyers and capable of extended flights. Females can move at least 100 m, but less than 600 m, from overwintering sites. Females are generally sedentary but a few individuals may make extended flights to new fields. Newly hatched larvae are active and able to disperse rapidly.

Economic importance: Medium, polyphagous species that is a minor greenhouse pest. Heavy infestations are sporadic. During the 1933 season in California, USA a Valencia grove lost an average of 597.5 fruits per tree from larval damage.

A. citrana injuries to the surface of developing fruit may develop scarring. The damage on older fruit leaves a depression, which may not heal if the damage occurs close to harvest. Damage levels of 25% and more have been reported in some years. The damage reduces both yield and grape quality.

Control in commercial orchards is achieved by the use of protective residual insecticides. If introduced, it would cause significant economic damage.

Quarantine status: Quarantine pest.

Estimated risk: High, as the larvae feed in grape clusters.

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4.1.3. Species: *Caliothrips fasciatus* (Pergande, 1895) [Thysanoptera: Thripidae]

Synonyms: *Heliothrips fasciatus* Pergande, 1895.

Common name(s): bean thrips.

Hosts: *Beta vulgaris* (sugar beet); *Citrullus lanatus* (water melon); *Citrus* spp. (oranges; lime *etc*.); *Citrus reticulata* (tangerines); *Gossypium arboreum* (cotton); *Pisum sativum* (pea); *Pyrus communis* (pear) and *Vitis vinifera* (grape vine). 28 species of crop plants and 48 species of ornamental or wild plants are affected.

Plant part affected: buds; flowers; fruit (contamination); leaves.

Distribution: Guatemala; Japan; Mexico; United States of America (California; Hawaii).

Biology:

Life history:

C. fasciatus feeds on the cell contents of leaves, stems, buds, and flowers. This thrips occasionally causes shoot and leaf damage to grape vines in early spring. The species does not normally feed on grape fruit. However they can often be found on fruit when infestations are of moderate to large size.

Virgin *Caliothrips fasciatus* produce only male offspring, whereas fertilized females produce mostly females with some males from non-inseminated eggs. After mating, *C. fasciatus* can oviposit for 67 days. The lifecycle of the first and second larvae, prepupa and pupal stages

takes 25 days at 21 °C, and is reduced to 8 days at 38 °C. At 21 and 38 °C the longevity of *C. fasciatus* adults is 15 and 7 days respectively.

The mortality of *C. fasciatus* in Californian soils is about 60%, with the death of mature larvae from moulting to the prepupal stage accounting for 34% of the total. Adult bean thrips can remain dormant on plant material and are capable of surviving low temperatures under dry conditions.

Entry potential: low to moderate. The insect cannot feed on grape clusters but is a known hitchhiker.

Establishment potential: Moderate, has a wide host range.

Spread potential: High, disperses readily via wind currents.

It is known that the insect breeds on at least 28 species of crop plants and 48 wild or ornamental plants. *C. fasciatus* prefers dry weather, but not extreme drought, although it is unknown whether the effect is nutritional or environmental.

Economic importance: Moderate, damage and crop losses caused to a wide range of economically important plants which are relevant to Australia. However, *C. fasciatus* is rarely considered a pest of grapes in the USA.

Quarantine status: Quarantine pest.

Estimated risk: Moderate, broad range of hosts and highly mobile but only present on grape clusters in moderate to high infestations.

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4.1.4. Species: *Colomerus vitis* (Pagenstecher, 1857) [Acarina: Eriophyidae]

Synonyms: *Eriophyes vitis* (Pagenstecher, 1857); *Phytoptus vitis* Pagenstecher, 1857.

Common name(s): grape bud mite; grape blister mite; grape erineum mite.

Hosts: Primary host: *Vitis vinifera* (grape vine). Other host: *Diospyros* spp. (malabar ebony).

Plant part affected: buds; leaves.

Distribution:

Erineum strain: Europe; Switzerland; United States of America.

Bud strain: Australia; Chile; Crimea; Egypt; Israel; South Africa; Spain; United States of America (California).
Leaf curl strain: Chile; Egypt; Hungary; Romania; South Africa; United States of America (California).

Biology:

Life history:

Three strains of *C. vitis* are recognised and are referred to as strains a, b and c.

Strain a: the erineum strain Females overwinter under the outer scales of dormant buds or bark crevices at the shoot base. In spring, they emerge to colonise the unfolding leaves where they induce the first erinea and start to reproduce. The oldest leaves usually show the most serious damage, although this occurs in patches. The first generation requires 25 days, although subsequent generations may develop faster. In late spring and early summer, the mites move towards the apical leaves where new erinea are induced. After the summer pruning, the infestation on young leaves increases until the females migrate to their overwintering sites.

Strain b: the bud strain The females overwinter inside the outermost inner buds. They feed on the primordia as the buds swell and lay one to a few eggs. The mites are carried in the leaf axils and may crawl between buds. Initially, the mites are found on the stipular scales, although they penetrate the newly formed bud scales to reach the primordia. Grape cluster primorida may be infested from mid–summer, with the greatest infestation occurring from late summer to early autumn. The basal and median buds (7th - 10th) are usually the most heavily infested. Females generally lay one egg per day with each generation taking 20 days to complete.

The bud strain feeding induces hypertrophied epidermal cells, which subdivide to form “polyps”, and produce scar tissue. Erinea are not induced by this strain. The main symptoms caused by the bud strain consist of scarification of green bark, short basal internodes, flattened shoots, stunting or death of buds and growing points, abnormal and crinkled basal leaves with coalesced leaf venation, and premature abscision of flower clusters. Infestation levels have not been linked to reduced yield.

Strain c: the leaf curl strain The leaf curl strain has a similar life cycle to that of the erineum strain, however the symptoms differ. It prefers hairy and young leaves and, like the bud strain, it does not induce typical erinea. In summer the infected leaves become curled

downward or rolled. Stunted growth and scarring of the shoots as well as necrosis and hypoplasia of the leaf underside can be observed.

Entry potential: Low, as it infests buds and leaves.

Establishment potential: Moderate, single primary host.

Spread potential: Moderate.

Economic importance: Moderate.

Feeding by *C. vitis* on grape leaf buds causes hypertrophy of epidermal cells which affect subsequent leaf growth. Hypertophied grape leaf epidermal cells do not die, but elongate to provide a favourable microhabitat for *C. vitis*.

Quarantine status: Quarantine pest [strain c (leaf curl) only].

Estimated risk: Moderate to low (strains a and b are already present in Australia).

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4.1.5. Species: *Desmia funeralis* (Hübner, 1796) [Lepidoptera: Pyralidae]

Synonyms: Not known.

Common name(s): grape leaffolder (GLF)

Hosts: *Cercis canadiensis* (American redbud); *Cercis chinensis* (Chinese redbud); *Parthenocissus quinquefolia* (Virginia creeper); *Vitis vinifera* (grape vine).

Plant part affected: fruit (under severe infestations); leaves.

Distribution: Brazil; Canada; United States of America (California, Florida and Missouri)

Biology:

Life history:

The eggs are small, flat, iridescent, elliptical and about 0.8 mm long. They are laid, usually singly, on either the upper or lower surfaces of leaves, with the lower surface preferred. Many eggs are laid against a vein. With large deposits, the eggs may overlap. The larvae, which feed on the leaves, are about 1.6 mm long when hatched and 15.4 mm to 22.2 mm long when fully grown. The larval period is around 3-4 weeks and they undergo five instars before pupation. There are no characteristic marks for field identification on the first two instars. The pupal case is brown, about 12.7 mm long.

Vector relationship: The larvae transmit *Briosia ampelophaga* (leaf blotch disease).

Entry potential: Low, as the larvae primarily feed on leaves. Larvae could survive during shipment and pupate when grape consignments reached the Australian mainland.

Establishment potential: Moderate, the insect has few alternate hosts which are native American grapes, only one of which is established in Australia.

Spread potential: Moderate, adults are mobile through flight.

Economic importance:

The grape leaffolder causes injury in the larval stage by rolling and feeding on the leaves, reducing photosynthetic function, and can cause as much as 50% damage. Under extreme population densities, it may feed on grape clusters, but economic damage usually occurs only with massive, late season infestations.

Quarantine status: Quarantine pest.

Estimated risk: Low. The larvae feed and pupate on leaves, but not generally associated with grape clusters.

References:

1. Aliniazee, M. T. (1974). Contribution to the bionomics of the grape leaffolder, *Desmia funeralis* (Hubner): A laboratory study with field observations [Lepidoptera: Pyralidae] Panpacific Entomology 50: 269 – 278.

2. Flaherty, D. L., Jensen, F. L., Kasimatis, N. A., Kido, H., and Moller, J. W. (1981). Grape pest management. Agricultural Science Publications: University of California, Berkeley.

3. Flaherty, D. L., Christensen, L. P., Lanini, W. T., Marois, J. J., Phillips, P. A., Wilson, L. T. (eds) (1992). Grape pest management, second edition. Division of Agriculture and Natural Resources : University of California, Berkeley, 400 pp.

4.1.6. Species: *Drepanothrips reuteri* Uzel, 1895 [Thysanoptera: Thripidae]

Synonyms: Not known.

Common name(s): eastern flower thrips; grape vine thrips, grape thrips.

Hosts: a wide range of horticultural crops, *Vitis vinifera* (grapes).

Plant part affected: fruit, leaves.

Distribution: Chile; France; Germany; Italy (Sicily); Switzerland; United States of America (California).

Biology:

Life history:

D. reuteri eggs are laid in young leaf and stem tissue. The first of three or four generations are produced asexually. Larvae begin to emerge in April, and adult thrips become obvious on upper leaf surfaces in May, usually peaking in July (mid-summer). Young grape leaves attacked by these larvae appear severely distorted. *D. reuteri* may have five to six generations

each year, consisting of: egg (seven days); larvae – two nymphal stages (seven days); prepseudopupa (one day); pseudopupa (two days); preoviposition period (five days).

D. reuteri larvae drop to the soil to pupate after feeding. They can be found in the debris under the vines or on the soil's surface and overwinter in the soil in low numbers, emerging when the grapevines begin growth the following season.

This species feeds on fruit early in the growth, when the berries are less than 3mm in diameter. Feeding on fruit discontinues in summer when the thrips move to new vegetative growth. Growers are generally unaware of grape thrips until mid summer when the shoot tips may be attacked. The bronzed leaves become stunted, and the internodes are shortened and scarred. After the population subsides normal growth resumes.

Entry potential: Moderate, the thrips feed on young fruit and could conceivably be present on ripe grape clusters, particularly if population numbers were high.

Establishment potential: Moderate, hosts reported as many horticultural crops.

Spread potential: High, disperses readily via wind currents, also has the capability for asexual reproduction, if the host is present.

Economic importance: High, significant pest on many horticultural crops, including grapes. Occasionally this species will severely scar table fruit. Grape thrips do not usually produce much foliar damage in the early spring due to low numbers. However, they are known to damage susceptable crop species including Salvadors grapes.

Quarantine status: Quarantine pest.

Estimated risk: Moderate, grape thrips could survive on grape clusters.

References:

1. Engel, V. R., Ohnesorge, B. (1994). The role of alternative food and microclimate in the system. *Typhlodromus pyri* Scheuten [Acari, Phytoseiidae] and *Panonychus ulmi* Koch [Acari, Tetranychidae] on grape vines. Journal of Applied Entomology 118: 129 – 150.

2. Flaherty, D. L., Jensen, F. L., Kasimatis, N. A., Kido, H., and Moller, J. W. (1981). Grape pest management. Agricultural Science Publications: University of California, Berkeley.

3. Flaherty, D. L., Christensen, L. P., Lanini, W. T., Marois, J. J., Phillips, P. A., Wilson, L. T. (eds) (1992). Grape pest management, second edition. Division of Agriculture and Natural Resources : University of California, Berkeley, 400 pp.

4.1.7. Species: *Eotetranychus carpini* (Oudemans, 1905) [Acarina: Tetranychidae]

Synonyms: *Eotetranychus carpini borealis* Ewing, 1913; *Eotetranychus carpini carpini* (Oudemans, 1905); *Eotetranychus carpini vitis* (Boisduval); *Schizotetranychus carpinula* Reck, 1950*; Schizotetranychus pterocaryae* Reck, 1950*; Tetranychus borealis* Ewing, 1913*;*

Tetrany chus carpini Oudemans, 1905*; Tetranychus flavus* Ewing, 1913*; Tetranychus monticolus* McGregor, 1917*; Tetranychus oregonensis* McGregor, 1917.

Bolland *et. al.* in their catalogue (1998) list *Tetranychus flavus* as a synonym *of Eotetranychus carpini* with no subpsecies quoted, the distribution of the species is given as USA and hosts include *Vitis vinifera*. A record of *Tetranychus flavus*, Ewing, 1913 as a pest of grapes in California is given in Bournier (1976). This record is taken from the article "Grape Pests of California" (1955 by L. M. Smith and E. M. Stafford, Division of Agricultural Sciences, University of California). In this article *Tetranychus flavus* is referred to as the "Willamette mite" which is a different species. Jeppson *et al*. (1975), in the treatise, "Mites injurious to economic plants" list the subspecies of *E. carpini* as *borealis*, *caprini* and *vitis* and state that only *vitis* is a pest of grapes and only *borealis* is in California. They do not mention *flavus*. However, they do say that *borealis* is easily confused with *E. willamettei* which is definitely a pest of grapes in California.

Common name(s): grapevine yellow spider mite; hornbeam mite; yellow mite; yellow spider mite.

Hosts: *Carpinus betulus* (European chestnut tree); *Castanea sativa* (Spanish chestnut); *Corylus avellana* (hazel)*; Prunus domestica* (plum)*; Vitis vinifera* (grape vine).

Plant part affected: fruit; leaves (necrosis); older shoots; young shoots.

Distribution: France; Germany**;** Italy; Lebanon; Spain; Switzerland; Turkey; United States of America (California).

Biology:

Life history:

E. carpini is minute in size, phytophagous and is a major mite pest in European vineyards. The life cycle lasts 13.5 days at 25 °C. Females, which generally comprise 75 % of the adult population, oviposit 3 eggs per day for 19 days. Egg development usually decreases from 28 to 10 days as average temperatures increase from 15 to 30 ^{o}C. The mites feed on leaves, young and older shoots and induce premature withering and fall of the leaves and reduce the sugar content of the grapes.

Entry potential: Moderate, as even though they are not directly on fruit, they are mobile and therefore mites may enter as hitchhikers and may also be missed at inspection due to their minute size.

Establishment potential: Moderate, hosts are relatively common and widespread in southern Australia.

Spread potential: Moderate to high, as mites are fairly mobile, have a short life cycle especially at high temperatures and can be transported in wind currents.

Economic importance: High, serious pest of vines in the Mediterranean region.

Quarantine status: Quarantine pest.

Estimated risk: High, as it causes serious damage to grapes. The mites could be easily introduced and established.

References:

1. Anonymous (1998). CABI Crop Compendium, Module 1.

2. Bolland, H. R., Gutierrez, J., and Fletchtmann, C. H. W. (1998). World catalogue of the spider mite family. Koninklijke Brill NV, Leiden, The Netherlands. 48.

3. Bonato, O., Cotton, D., Kreiter, S., and Gutierrez, J. (1990). Influence of temperature on the life history parameters of the yellow grapevine mite *Eotetranychus carpini* (Oudemans) [Acari: Tetranychidae]. International Journal of Acarology 16: 241 – 245.

4. Bournier, A. (1976). Grape insects. Annual Review of Entomology 22: 355 – 376.

5. Jeppson, L. R., Keifer., H. H., and Baker, E. W. (1975). Mites injurious to economic plants. University of California Press, Berkeley, California. 614.

6. Laffi, F. (1982). Grapevine yellow spider-mite, *Eotetranychus carpini* Oud. f. *vitis* Dosse. Informatore Fitopatologica 32: 31 – 34.

7. Liguori, M. (1976). Tests on the adaptation of *Eotetranychus carpini* Oud. f. *vitis* Dosse, on *Carpinus betulus* L. Redia 59: 369 – 373.

8. Smith, L. M., and Stafford, E. (1955). Grape pests in California. California Agricultural Experimental Station Circular 445. 63.

9. Flaherty, D. L., Christensen, L. P., Lanini, W. T., Marois, J. J., Phillips, P. A., Wilson, L. T. (eds) (1992). Grape pest management, second edition. Division of Agriculture and Natural Resources : University of California, Berkeley, 400 pp.

4.1.8. Species: *Eotetranychus willamettei* McGregor, 1917 [Acarina: Tetranychidae]

Synonyms: Not known.

Common name(s): Willamette spider mite.

Hosts: *Vitis vinifera* (grape vine).

Plant part affected: fruit (under heavy infestations); grape leaves.

Distribution: United States of America (California).

Biology:

Life history:

Willamette spider mites deposit spherical eggs individually on the leaf under surface, particularly along the mid rib and veins. Newly laid eggs are translucent with a fine papilla (hair) that tapers at the top, becoming opaque during incubation. Adult mite females are

0.5 mm long and are usually pale yellow with small black dots along the sides of the body behind the eyes. Adult males are easily recognized by their pointed abdomens and smaller size. Damage by Willamette spider mites causes foliar bronzing. These mites overwinter during lower temperatures.

Entry potential: Moderate, as mites may be on fruit or enter as hitchhikers and may be missed at inspection due to their minute size.

Establishment potential: Moderate, in areas where grapes are grown.

Spread potential: Moderate, can be transported in wind currents.

Economic importance: Low, the damage caused by Willamette spider mites is minimal and can be controlled. The mites seldom produce economic damage to grapevines in the San Joaquin Valley in California and infrequently require control.

Quarantine status: Quarantine pest.

Estimated risk: Moderate, as mites may be missed at inspection.

References:

1. Flaherty, D. L., Christensen, L. P., Lanini, W. T., Marois, J. J., Phillips, P. A., Wilson, L. T. (eds) (1992). Grape pest management, second edition. Division of Agriculture and Natural Resources : University of California, Berkeley, 400 pp.

2. Karban, R., Hougen-Eitzmann, D., and English-Loeb, G. (1994). Predator mediated apparent competition between herbivores that feed on grapevines. Oecologia 97: 508 – 511.

4.1.9. Species: *Estigmene acrea* Drury, 1773 [Lepidoptera: Arctiidae]

Synonyms: Not known.

Common name(s): salt marsh caterpillar.

Hosts: a wide variety of commercial crops and weeds, including *Beta vulgaris* (beetroot); *Brassica oleracea* (cabbage); *Cynara scolymus* (artichoke); *Gossypium arboreum* (cotton); *Lactuca sativa* (lettuce); *Lupinus arboreus* (lupin); *Lycopersicon esculentum* (tomato); *Phaseolus vulgaris* (common bean); *Vitis vinifera* (grape vine); *Zea mays* (maize).

Plant part affected: fruit (contamination); leaves.

Distribution: Canada; Colombia; Honduras; Mexico; Nicaragua; United States of America (Arizona, California, Colorado, Nebraska, South Carolina).

Biology:

Life history:

The spherical, somewhat flattened, and finely sculptured eggs are about 0.8 mm in diameter. They range from pearly white to creamy yellow and are laid in compact groups, usually on the undersurfaces of leaves. A female may lay as many as 1000 eggs, with 200 or more in each egg mass. On hatching, young larvae are light buff with clusters of long, dark hairs over

the body. As larvae increase in size, they become more hairy. Overwintering occurs in the fully grown larvae. The pupae are usually under leaf trash on the soil and are enclosed in thin cocoons that may have larval hairs included in the silk walls. This caterpillar is particularly abundant on plants containing high levels of phenolics, including tannins.

First and second instar larvae remain near an egg site and feed on lower leaf surfaces. Older larvae feed independently, eat through the leaves, and leave the foliage ragged. The injury they cause resembles that of western grape leaf skeletonizer. Extensive injury reduces vine vigour and exposes the grape berries to sunburn and quality loss. Some salt marsh caterpillars pupate in the grape bunches, making fruit unsalable because of its poor appearance. The life cycle may be completed in 6 weeks under optimum conditions.

Entry potential: Moderate, pupae could be present in bunches.

Colonisation potential: Moderate, the pest has a wide host range but a relatively long life cycle which includes an overwintering period.

Spread potential: High, as adults are winged.

Economic importance: recorded as an occasional pest of grapes.

Quarantine status: Quarantine pest.

Estimated risk: Moderate.

References:

1. Krasnoff, S. B., and Roelofs, W. L. (1989). Quantitative and qualitative effects of larval diet on male scent secretions of *Estigmene acrea*, *Phragmatobia fuliginosa* and *Pyrrharctia isabella* [Lepidoptera: Arctiidae]. Journal of Chemical Ecology. 15: 1077 – 1093.

2. Flaherty, D. L., Christensen, L. P., Lanini, W. T., Marois, J. J., Phillips, P. A., Wilson, L. T. (eds) (1992). Grape pest management, second edition. Division of Agriculture and Natural Resources : University of California, Berkeley, 400 pp.

4.1.10. Species: *Frankliniella minuta* (Moulton, 1907) [Thysanoptera: Thripidae]

Synonyms: Not known.

Common name(s): minute flower thrips.

Hosts: Asteraceae; *Vitis vinifera* (grape).

Plant part affected: flower; leaf; stem; bud.

Distribution: Colombia; Costa Rica; South America; USA (California, Florida).

Biology:

Life history:

Adults are less than 1mm in length. Limited biological information is available for this species however, data has been extrapolated from life history information of related species

(particularly western flower thrips (*Frankliniella occidentalis*). This species probably feeds on the cell contents of leaves, stems, buds, and flowers. This thrips is responsible for minor shoot and foliar damage of grapes in association with western flower thrips (*F. occidentalis*) and grape thrips (*Drepanothrips reuteri*). The species does not feed on grape fruit however, they can possibly be found on fruit when infestations are of moderate to large size. They have the ability to conceal themselves in small crevices *etc*., and the eggs are protected by the epidermis of the plant. The interocellar setae of this species are short when compared with western flower thrips which have long setae.

Entry potential: Moderate, particularly if infestations are high as species is cryptic.

Establishment potential: Moderate, it has limited number of known hosts however, this may be due to a lack of research.

Spread potential: Moderate, can be transported in wind currents.

Economic importance: Low, recorded as a minor pest of grapes.

Quarantine status: Quarantine pest.

Estimated risk: Low, as it is not a significant pest of grapes.

References:

1. Cardenas, E., and Corredor, D. (1993). Thrips species [Thysanoptera: Thripsidae] most common in cut flowers in the greenhouse in the Bogota plateau. Agronomia Colombiana 10: 132 – 143.

2. Flaherty, D. L., Christensen, L. P., Lanini, W. T., Marois, J. J., Phillips, P. A., Wilson, L. T. (eds) (1992). Grape pest management, second edition. Division of Agriculture and Natural Resources : University of California, Berkeley, 400 pp.

4.1.11. Species: *Frankliniella occidentalis* (Pergande, 1895) [Thysanoptera: Thripidae]

Synonyms: *Frankliniella californica* (Moulton, 1907); *Frankliniella helianthi* (Morgan, 1913); *Frankliniella moultoni* Hood, 1914; *Frankliniella treherneri* Morgan, 1925.

Common name(s): western flower thrips; alfalfa thrips.

Hosts: *Allium cepa* (onions); *Capsicum* (chilli)*; Carthamus tinctorius* (safflower); *Citrus paradisi* (grapefruit); *Cucurbit*a spp. (pumpkin, squash, zucchini, etc.); *Daucus carota* (carrot); *Duchesnea indica* (Indian strawberry); *Gladiolus tirstis* (gladiolus); *Gossypium arboreum* (cotton); *Lathyrus odoratus* (sweet pea); *Lycopersicon esculentum* (tomato); *Petrorhagia nanteuilii* (carnation); *Pisum sativum* (pea); *Prunus armeniaca* (apricot); *Prunus domestica* (plum); *Prunus persica* (peach, nectarine); *Rosa* spp. (roses); *Vigna* spp. (bean); *Vitis vinifera* (grape vine). 244 plant species from 62 families.

Plant part affected: fruit; leaves.

Distribution: *F. occidentalis* is indigenous to North America (Canada, continental United States of America, Mexico). It began to spread internationally around 1980 and has now been reported from countries in all continents of the world.

Distribution in Australia:
QLD- considered widespread, although some monitoring is undertaken to verify property freedom.
NSW- considered widespread, although some monitoring is undertaken to verify property freedom.
NT- no records of this pest being detected.
SA- limited to the Northern Adelaide plains.
TAS- detected on several properties only.
VIC- detected on several properties only.
WA- considered established, restrictions on movement of host material have been removed.

All States/Territories except WA impose interstate quarantine restrictions on incoming produce and require either inspection or treatment. South Australia, Victoria and Tasmania undertake extensive surveys for WFT with South Australia and Tasmania having state wide surveys and Victoria having a major monitoring program for produce destined for Tasmania. If WFT is detected in these States quarantine measures are imposed on the affected properties.

Biology:

Life history:

Western Flower Thrips (WFT) are small insects, 1 mm long, with distinctive feathery wings. WFT are multivoltine, reaching a peak to coincide with the grape flower bloom, although both the adult and nymphal stages overwinter. The eggs hatch after five days to produce larvae that feed on the host for 7 to 12 days. WFT undergo prepseudopupal and pseudopupal stages in soil debris that last four to five days. They have the ability to conceal themselves in small crevices *etc*.

These thrips attack fruit and foliage directly. Damage on grapevines consists of :
(1) halo spotting that can make the fruit of certain white varieties unsightly and unmarketable; (2) berry scarring on Thompson Seedless that also can render them unsaleable and (3) shoot stunting and foliage damage.

Vector relationship: Implicated in virus transmission.

Entry potential: High, can occur on fruit and can be difficult to detect due to it's small size and cryptic nature.

Establishment potential: High, has a broad range of hosts.

Spread potential: High, capable of dispersal by wind currents.

Economic importance: Moderate, species is a minor pest on grapes but can sporadically become a serious pest on other crops.

Quarantine status: Quarantine pest.

Estimated risk: Moderate. WFT are already established in some Australian states however, all States/Territories except WA impose interstate quarantine restrictions.

References:

1. Flaherty, D. L., Christensen, L. P., Lanini, W. T., Marois, J. J., Phillips, P. A., Wilson, L. T. (eds) (1992). Grape pest management, second edition. Division of Agriculture and Natural Resources : University of California, Berkeley, 400 pp.

2. Smith, I. M., McNamara, D. G., Scott, P. R., and Holderness, M. (1997). Quarantine pests for Europe. Data sheets on quarantine pests for the European Communities and for the European and Mediterranean Plant Protection Organisation. (2nd ed.) CAB International: New York 1425 pp.

4.1.12. Species: *Harrisina brillians* Barnes and McDunnough, 1910 [Lepidoptera: Zygaenidae]

Synonyms: *Harrisina metallica* Stretch, 1885.

Common name(s): western grape leaf skeletonizer (GLS).

Hosts: *Parthenocissus cuspidata* (Boston ivy); *Parthenocissus quinquefolia* (Virginia creeper); *Vitis vinifera* (grape vine). Possible incidental hosts include: *Prunus armeniaca* (apricot); *Prunus avium* (cherry); *Prunus dulcis* (almond) and *Rosa* spp. (roses).

Plant part affected: fruit; leaves.

Distribution: Mexico; United States of America (Arizona, California).

GLS was originally distributed through Arizona, Colorado, Nevada, Utah and Mexico (Aguascalientes, Chihuahua, Coahuila, Sonora).

Biology:

Life history:

GLS produce three generations per year. The white to pale yellow, capsular shaped eggs of GLS are 0.4mm x 0.6mm . Most egg clusters are laid on the underside of leaves where they hatch simultaneously. GLS has five larval stages, and the strongly gregarious larvae feed together in circular rows for the first three instars. They strip underside tissue from leaves, forming “white spots”. The larvae grow from 1.6 to 16 mm long from the first to the fifth instar which pupate in silken cocoons. Pupae are found in trash at the base of grape vines or under loose bark. GLS overwinters in the pupal stage. Oviposition of first generation adults occurs after the flush of new shoots and leaves on grapevines in Spring

Larvae destroy the leaf blade without damaging the upper epidermis. The first to third instar larvae feed on the lower leaf surface, leaving only the veins and upper cuticle. The fourth and fifth instar larvae skeletonize the leaves, leaving only the larger veins. Complete defoliation by second and third generation GLS has occured in the central San Joaquin Valley in California. Where population levels are high, fourth and fifth instar larvae feed on berries after they have consumed most of the foliage. Feeding damage to bunches usually causes bunch rot and results in the loss of the entire cluster.

Entry potential: Low, larvae mostly colonise leaves.

Establishment potential: Moderate, in areas where host is present.

Spread potential: Moderate, adults have ability to fly and females can deposit a large number of eggs on potential hosts.

Economic importance: Severe. In parts of California the larvae of this insect is a serious defoliating pest of vineyards, backyard grapevines and wild grapes in parks and along rivers and streams.

Quarantine status: Quarantine pest.

Estimated risk: Moderate, pupae can tolerate cold, damage to crop can be severe.

References:

1. Bournier, A. (1977). Grape insects. Annual Review of Entomology 22: 355 – 376.

2. Flaherty, D. L., Christensen, L. P., Lanini, W. T., Marois, J. J., Phillips, P. A., Wilson, L. T. (eds) (1992). Grape pest management, second edition. Division of Agriculture and Natural Resources : University of California, Berkeley, 400 pp.

3. McGrew, J. R., Still, G. W. (1972). Control of grape diseases and insects in the eastern United States. Farmers' Bulletin 1893: 24.

4.1.13. Species: *Platynota stultana* Walshingham, 1884 [Lepidoptera: Tortricidae]

Synonyms: *Platynota chiquitana* Barnes and Busck, 1920.

Common name(s): carnation moth; cotton leaf roller; leaf tier; omnivorous leaf roller; orange calyx worm; orange platynota; orange web worm; rose leaf roller.

Hosts: *Apium graveolens* (celery); *Beta vulgaris* ssp. *vulgaris* (sugar beet), *Capsicum annuum* (capsicum); *Citrullus* spp. (melon); *Citrus* (orange, lime etc.); *Duchesnea indica* (Indian strawberry); *Gossypium arboreum* (cotton); *Juglans regia* (walnut); *Lactuca sativa* (lettuce); *Lycopersicon esculentum* (tomato); *Malus domestica* (apple); *Medicago sativa* (alfalfa); *Piper nigrum* (pepper); *Prunus armeniaca* (apricot); *Prunus domestica* (plum); *Prunus persica* var. *nucipersica* (nectarine); *Prunus persica* (peach); *Sorghum bicolor* (sorghum); *Vitis vinifera* (grape vine).

Susceptible ornamentals include: *Aster subulatus* (aster); *Petrorhagia* spp. (carnation); *Chrysanthemum morifolium* (chrysanthemum); *Cyclamen persicum* (cyclamen);

Eucalyptus sp. (eucalyptus); *Fuchsia* spp. (fuschia); *Geranium carolinianum* (geranium); *Portulaca oleracea* (common purslane); *Rosa* spp. (roses).

Susceptible weeds are: *Artemisia douglasiana* (California mugwort); *Malva parviflora* (cheeseweed); *Canada fleabane* (horseweed or mare's tail); *Chenopodium album* (lambsquarters); *Amaranthus* spp. (pigweed).

Plant part affected: flower (by larvae); fruit (internal feeding by larvae); leaves (by larvae). Leaf feeding is generally minor. Onivorous leaf roller pupae gather amongst flower clusters, leaves and shoot tips.

Distribution: United States of America (Arizona, California, Florida, Illinois, Maryland, Massachusetts, Mexico, Michigan, Texas, Virginia, Pennsylvania and Washington).

Biology:

Life history:

Omnivorous leaf rollers produce six generations per year, comprising a life cycle of 30 to 45 days. Larval omnivorous leaf rollers overwinter in grape mummies, vineyard weeds, and other trash in the vineyard. In spring, larvae complete their development and the emerging moths lay shingle–like egg masses on grape leaves. The eggs hatch 5 days after oviposition. The solitary larvae web two young leaves together to form a nest in which they feed. Newly hatched larvae are less than 1.6 mm long and mature larvae average about 12.7 mm. Larvae usually moult five times before pupation. The insect attacks all non-woody parts of vines.

Entry potential: High, as larvae are internal feeders in fruit (they also damage grape leaves).

Establishment potential: High, has a broad range of hosts.

Spread potential: High, short life cycle with six generations per year.

Economic importance: High. The omnivorous leaf roller causes serious damage in California's Central Valley and North Coast vineyards by way of attacking nonligneous parts of grapes.

Omnivorous leaf rollers feed on developing berries and flowers, which enables fungal rot organisms to enter fruit at the sites where it feeds. Bunch rot can cause up to 15% loss of grapes.

Quarantine status: Quarantine pest.

Estimated risk: High, carried internally in fruit.

References:

1. Bournier, A. (1977). Grape insects. Annual Review of Entomology 22: 355 – 376.

2. Flaherty, D. L., Christensen, L. P., Lanini, W. T., Marois, J. J., Phillips, P. A., Wilson, L. T. (eds) (1992). Grape pest management, second edition. Division of Agriculture and Natural Resources : University of California, Berkeley, 400 pp.

3. Lynn, C. D. (1969). Omnivorous leaf roller, an important new grape pest in the San Joaquin Valley. California Agriculture 23: 16 – 17.
4. Van der Geest, L.P.S., and Evenhius, H.H. (1991). Tortricid Pests, their Biology, Natural Enemies and Control. Elseveir Science Publishers: The Netherlands 808 pp.

4.1.14. Species: *Pseudococcus maritimus* (Erhorn, 1900) [Hemiptera: Pseudococcidae]

Synonyms: *Dactylopius maritimus* (Ehrhorn, 1900); *Planococcus maritimus* (Erhorn, 1900); *Pseudococcus bakeri* Essiz, 1910; *Pseudococcus omniverae* Hollinger, 1917.

Common name(s): grape vine mealybug (GMB).

Hosts: *Alternanthera pungens* (khaki weed); *Camellia sinensis* (tea); *Citrus* spp. (orange, lime); *Cydonia oblonga* (quince); *Gladiolus* spp. (gladiolus); *Juglans regia* (walnut); *Lens culinaris* (lentils); *Malus domestica* (apple); *Manihot esculenta* (cassava); *Medicago sativa* (alfalfa); *Parthenium* spp. (parthenium weed); *Prunus armeniaca* (apricot); *Prunus persica* (peach); *Pyrus communis* (pear); *Solanum tuberosum* (potato); *Solidago sempervirens* (golden rod); *Vitis vinifera* (grape vine).

Plant part affected: adult insects contaminate foliage and fruits.

Distribution: Argentina; Azerbaijan; Brazil; Chile; Egypt; Georgia; Gibraltar; Guatemala; Iran; Mexico; New Zealand; Peru; South Africa; Sri Lanka; United States of America (California, Hawaii).

Biology:

Life history:

Small, white waxy insects; adult males only are winged. The wingless females lay up to 600 eggs in an ovisac. The early instar stage males and females appear similar. The male passes through three nymphal instars, then forms a flimsy cottony cocoon about 3 mm long where pupation occurs.

The juveniles and adult females form clusters on leaves and at the base of berries. GMB overwinter under old wood as eggs or newly hatched crawlers. Eggs are usually laid under old wood, however in spring eggs are at times laid within the grape clusters. Honey dew causes down-grading of bunches of grape berries. It is most severe on varieties that produce clusters close to the base of the shoot.

Entry potential: Moderate to high, as GMB may thrive in fruit clusters and are mobile.

Establishment potential: Moderate to high, broad range of hosts.

Spread potential: Low to moderate, mealybugs tend not to disperse quickly.

Economic importance: Moderate. GMB have a wide range of hosts. They do not reduce crop yield, but contaminate fruit and foliage. Susceptibility to GMB damage varies by variety.

Quarantine status: Quarantine pest.

Estimated risk: Moderate to high in fruit, broad range of hosts, and some GMB stages are difficult to detect due to their small size. GMB is important in California as a pest of grapes, particularly in areas of the Kern and Tulare Counties. It is sometimes found in the Salinas and Santa Clara Valleys, but it is not considered important there. In 1978 and 1979 GMB outbreaks were also reported in Napa Valley vineyards.

References:

1. Bournier, A. (1977). Grape insects. Annual Review of Entomology 22: 355 – 376.

2. Flaherty, D. L., Christensen, L. P., Lanini, W. T., Marois, J. J., Phillips, P. A., Wilson, L. T. (eds) (1992). Grape pest management, second edition. Division of Agriculture and Natural Resources : University of California, Berkeley, 400 pp.

3. McGrew, J. R., Still, G. W. (1972). Control of grape diseases and insects in the eastern United States. Farmers' Bulletin 1893: 24.

4.1.15. Species: *Scirtothrips citri* (Moulton, 1909) [Thysanoptera: Thripidae]

Synonyms: *Euthrips citri* Moulton, 1909.

Common name(s): California citrus thrips; Californian thrips.

Hosts: Primarily C*itrus* spp. Other plants: *Carya illinoensis* (pecan); *Gossypium hirsutum* (cotton); *Magnolia* spp. (magnolia); *Phoenix dactylifera* (date); *Rosa* spp. (roses); *Vitis vinifera* (grape vine).

Plant part affected: fruit (grapes and citrus); leaves.

Distribution: Mexico (northern); United States of America (Arizona, California and Florida).

Biology:

Life history:

Californian citrus thrips can produce eight generations per year in favourable conditions. Adult thrips are less than 1mm in length, orange yellow insects with fringed wings. Female lays about 25 eggs in new leaf tissue, young fruit, or green twigs during spring and summer. First instar larvae are very small, whereas second instar larvae are about the size of adults, spindle-shaped, and wingless. They feed actively on tender leaves and young fruit, especially under the sepals of young fruit. Third and fourth instar (prepupa and pupa) thrips do not feed and complete development on the ground or in the crevices of trees. When adults emerge, they move actively around the tree foliage.

Entry potential: Low, only young fruits are attacked and the species may occasionally infest grape berries. The risk of thrips being carried on harvested mature fruits is minimal.

Establishment potential: High, has a broad range of hosts including citrus.

Spread potential: Low.

There is limited potential for the natural spread of *S. citri*. For example, it could be carried on nursery plants, however such interceptions are relatively rare. Unlike many other Thysanoptera, *Scirtothrips* spp. seem to require access to soft green tissues, except when pupating in leaf litter and soil.

Hence, only seedlings or cuttings with young growing leaf buds are liable to carry these pests. There is no direct evidence that *S.citri* has been dispersed beyond its natural range by human activity.

Economic importance: Californian citrus thrips have only been reported as a pest of grapes in Coachella Valley, Riverside County in California. Distorted leaf tips are observed when large populations are present in late summer and fall. Their feeding is not usually considered damaging. Occasionally Californian citrus thrips may scar young grape berries in the first few rows adjoining citrus groves. They seldom require control.

Quarantine status: Quarantine pest.

Estimated risk: Moderate to low, the species is present in California and there is a possibility for it to be introduced via leaves or berries of grapes.

S. citri has recently been added to the European and Mediterranean Plant Protection Organization (EPPO) A1 list but has not been classed as a quarantine pest by any other regional plant protection organization. The occurrence of *S. citri* in citrus-growing areas with a subtropical or Mediterranean climate suggests that it could probably establish on citrus in southern Europe and the Mediterranean area. It is a damaging pest of citrus, and requires insecticide treatments.

References:

1. Flaherty, D. L., Christensen, L. P., Lanini, W. T., Marois, J. J., Phillips, P. A., Wilson, L. T. (eds) (1992). Grape pest management, second edition. Division of Agriculture and Natural Resources : University of California, Berkeley, 400 pp.

2. Smith, I. M., McNamara, D. G., Scott, P. R., and Holderness, M. (1997). Quarantine pests for Europe. Data sheets on quarantine pests for the European Communities and for the European and Mediterranean Plant Protection Organisation. (2nd ed.) CAB International: New York 1425 pp.

4.1.16. Species: *Tetranychus pacificus* McGregor, 1919 [Acarina: Tetranychidae]

Synonyms: *Dactylopius maritimus* Ehrhorn, 1900

Common name(s): Pacific spider mite (PSM).

Hosts: *Gossypium arboreum* (cotton); *Juglans regia* (walnut)*; Phaseolus lunatus* (lima bean); *Prunus persica* var. *nucipersica* (nectarine); *Prunus dulcis* (almond)*; Rubus idaeus* (raspberry)*; Vitis vinifera* (grape vine).

Plant part affected: leaves (grape).

Distribution: Canada; Mexico; United States of America (California).

Biology:

Life history:

PSM deposits single eggs on the leaf undersurface, particularly between midrib and veins. PSM eggs are found on the upper leaf surface only when population densities are high. The life span of adult females is nine days, and the 57 eggs the female lays have a generation time of 12 days at 29 °C.

Newly hatched larvae have six legs, while the protonymphs have eight legs. Adult Pacific mite females are 0.5 mm long. The insect feeds on exposed leaves, and the damage changes from yellow spots to necrotic areas on the bronzed leaves. Damage appears worse along the shoulder and tops of the vines.

Entry potential: Moderate to high, may be present as a hitchhiker on fruit if populations are high.

Establishment potential: Moderate to high, as it has a broad range of hosts.

Spread potential: High, mites can be carried on wind currents.

Economic importance: High, it can cause a significant proportion of yield loss in a number of crops. Fruit quality or maturity may be adversely affected by PSM because of loss of productive leaf surface. Leaf shedding occurs with heavy PSM populations. Thompson Seedless grapes are very susceptible to PSM.

Quarantine status: Quarantine pest.

Estimated risk: High, the species is present in California and it could be introduced if populations are high.

References:

1. Bournier, A (1977). Grape insects. Annual Review of Entomology 22: 355 – 376.

1. Flaherty, D. L., Christensen, L. P., Lanini, W. T., Marois, J. J., Phillips, P. A., Wilson, L. T. (eds) (1992). Grape pest management, second edition. Division of Agriculture and Natural Resources : University of California, Berkeley, 400 pp.

5. QUARANTINE STATUS OF PESTS AND DISEASES ASSOCIATED WITH TABLE GRAPES IN CALIFORNIA

Of the 147 arthropod species known on grapes in the United States, 109 species are reported to occur in California. Of the 109 species, 37 also occur in Australia. Of the 37 species, two insect pests are under official control in some states in Australia. However, one insect species (grape phylloxera) is not found on the commodity pathway and is therefore not of concern for imported grape fruit. Of the remaining 72 species, 16 are of quarantine concern as they do not occur in Australia and can cause

economic damage and may be associated with table grapes throughout the production and marketing chain.

There are 118 micro-organisms (fungi, bacteria, viruses etc.) reported on grapes in the USA, of which 82 have been reported to occur in California. Of these, 67 also occur in Australia and none of the remaining micro-organisms are of quarantine concern.

Table 1 shows the biological assessment of the quarantine status of arthropods and diseases of grapes present in the United States of America. The table does not include ectoparasitioids and endoparasitoids and social insects that are not deemed as direct pests on grapes in California.

Table 1. Biological assessment of the quarantine status of arthropods and diseases

Species[1]		Common Name	Present in USA	Present in California	Present in Australia	Australian Quarantine Status	Present on Pathway[2] (fruit)	Quarantine Risk Management Required
ARTHROPODS								
1	*Acia lineatifrons*	leafhopper	yes	no	no	quarantine pest	no	
2	*Agrotis ipsilon*	greasy (black) cutworm	yes	yes	yes	non-quarantine pest	no	
3	*Aleurocanthus woglumi*	citrus black fly; blue grey fly; citrus spring white fly	yes	no	no	quarantine pest	no	
4	*Altica ampelophaga*	flea beetle	yes	no	no	quarantine pest	no	
5	*Altica chalybea*	grape flea beetle	yes	yes	no	quarantine pest	no	
6	*Altica torguata*	grape vine flea beetle (leaf beetle)	yes	yes	no	quarantine pest	no	
7	*Amanthes c-nigrum*	spotted cutworm	yes	yes	no	quarantine pest	no	
8	*Ampeloglypter ater*	grape cane girdler	yes	yes	no	quarantine pest	no	
9	*Ampeloglypter sesostris*	grape cane gallmaker	yes	yes	no	quarantine pest	no	
10	*Amyelois transitella*	navel orangeworm	yes	yes	no	quarantine pest	yes	methyl bromide fumigation, standard phytosanitary procedures
11	*Aonidiella aurantii*	California red scale	yes	yes	yes	non-quarantine pest	no	
12	*Aphis citricola*	aphid	yes	yes	no	quarantine pest	no	
13	*Aphis gossipyii*	cotton aphid	yes	yes	yes	non-quarantine pest	no	
14	*Aphis illinoisensis*	grape vine aphid	yes	no	no	quarantine pest	no	
15	*Arboridia adanae*	grape leafhopper	yes	no	no	quarantine pest	no	
16	*Arboridia apicalis*	grape leafhopper	yes	no	no	quarantine pest	no	
17	*Argyrotaenia citrana*	orange tortrix	yes	yes	no	quarantine pest	yes	methyl bromide fumigation, standard phytosanitary procedures

Species[1]		Common Name	Present in USA	Present in California	Present in Australia	Australian Quarantine Status	Present on Pathway[2] (fruit)	Quarantine Risk Management Required
18	*Argyrotaenia velutinana*	red banded leaf roller	yes	no	no	quarantine pest	no	
19	*Asterolecanium pustulans*	pustule scale, oleander pit scale, akee fringed scale	yes	yes	no	quarantine pest	no	
20	*Aspidiotus nerii*	oleander scale	yes	yes	yes	non-quarantine pest	no	
21	*Blapstinus* sp.	darkling ground beetle	yes	yes	no	quarantine pest	no	
22	*Bromius obscurus*	western grape root worm	yes	yes	no	quarantine pest	no	
23	*Cadra figulilella*	raisin moth	yes	yes	yes	non-quarantine pest	no	
24	*Caliothrips fasciatus*	bean thrips	yes	yes	no	quarantine pest	yes	methyl bromide fumigation, standard phytosanitary procedures
25	*Carnocephala fulgida*	leafhopper	yes	no	no	quarantine pest	no	
26	*Carpophilus* sp.	dried fruit beetle	yes	no	yes	non-quarantine pest	no	
27	*Cerasphorus albofasciatus*	grape trunk borer	yes	no	no	quarantine pest	no	
28	*Ceratitis capitata*	mediterranean fruit fly	yes	no	yes (official control - Western Australia)	quarantine pest	no	
29	*Ceresa bubalus*	leafhopper	yes	no	no	quarantine pest	no	
30	*Chrysomphalus aonidum*	Florida red scale	yes	yes	yes	non-quarantine pest	no	
31	*Cicada septemdecim*	periodical cicada	yes	yes	no	quarantine pest	no	
32	*Cicadella viridis*	green leafhopper	yes	no	no	quarantine pest	no	
33	*Coccus hesperidum*	soft brown scale	yes	yes	yes	non-quarantine pest	no	
34	*Collaspis brunnea*	grape colaspis beetle	yes	no	no	quarantine pest	no	
35	*Coniontis parviceps*	dark brown beetle	yes	yes	no	quarantine pest	no	
36	*Conoderus* sp.	wire worm clickbeetle	yes	yes	yes	non-quarantine pest	no	
37	*Contarina* sp.	grape flower midges	yes	no	no	quarantine pest	no	
38	*Craponius inaequalis*	grape curculio	yes	no	no	quarantine pest	no	

Species[1]		Common Name	Present in USA	Present in California	Present in Australia	Australian Quarantine Status	Present on Pathway[2] (fruit)	Quarantine Risk Management Required
39	*Daktulosphaira vitifoliae*	grape phylloxera (cochineal scale, vine louse)	yes	yes	yes (official control - SA, VIC, NSW)	quarantine pest	no	
40	*Desmia funeralis*	grape leaffolder	yes	yes	no	quarantine pest	yes	methyl bromide fumigation, standard phytosanitary procedures
41	*Diaspidiotus uvae*	grape scale	yes	yes	no	quarantine pest	no	
42	*Draeculacephala minerva*	green sharpshoooter	yes	yes	no	quarantine pest	no	
43	*Drepanothrips reuteri*	eastern flower thrips (grape vine thrips)	yes	yes	no	quarantine pest	yes	methyl bromide fumigation, standard phytosanitary procedures
44	*Drosophila melanogaster*	vinegar fly	yes	yes	yes	non-quarantine pest	no	
45	*Empoasca fabae*	potato leafhopper	yes	yes	no	quarantine pest	no	
46	*Empoasca punjabensis*	leafhopper	yes	no	no	quarantine pest	no	
47	*Empoasca vitis*	grape leafhopper	yes	no	no	quarantine pest	no	
48	*Erythraspides vitis*	grape sawfly	yes	no	no	quarantine pest	no	
49	*Erythroneura calycula*	eastern grape leafhopper	yes	no	no	quarantine pest	no	
50	*Erythroneura coloradensis*	eastern grape leafhopper	yes	no	no	quarantine pest	no	
51	*Erythroneura comes*	eastern grape leafhopper	yes	yes	no	quarantine pest	no	
52	*Erythroneura elegantula*	western grape leafhopper	yes	yes	no	quarantine pest	no	
53	*Erythroneura maculator*	three banded grape leafhopper	yes	no	no	quarantine pest	no	
54	*Erythroneura tricincta*	three banded grape leafhopper	yes	no	no	quarantine pest	no	
55	*Erythroneura variabilis*	variegated eastern grape leafhopper	yes	yes	no	quarantine pest	no	
56	*Erythroneura vitifex*	leafhopper	yes	no	no	quarantine pest	no	
57	*Erythroneura vitis*	leafhopper	yes	no	no	quarantine pest	no	
58	*Erythroneura vulerata*	leafhopper	yes	no	no	quarantine pest	no	
59	*Erythroneura ziczac*	leafhopper	yes	no	no	quarantine pest	no	

Species[1]		Common Name	Present in USA	Present in California	Present in Australia	Australian Quarantine Status	Present on Pathway[2] (fruit)	Quarantine Risk Management Required
60	*Estigmene acrea*	salt marsh caterpillar	yes	yes	no	quarantine pest	yes	methyl bromide fumigation, standard phytosanitary procedures
61	*Eulithis diversilineata*	grape vine looper	yes	no	no	quarantine pest	no	
62	*Euschistus conspersus*	consperse stink bug	yes	yes	no	quarantine pest	no	
63	*Eumorpha achemon*	achemon sphinx moth	yes	yes	no	quarantine pest	no	
64	*Euxoa messoria*	darksided cutworm	yes	yes	no	quarantine pest	no	
65	*Evoxysoma vitis*	grape seed chalcid	yes	no	no	quarantine pest	no	
66	*Fidia viticida*	grape root worm	yes	no	no	quarantine pest	no	
67	*Forficula auricularia*	European earwig	yes	yes	yes	non-quarantine pest	no	
68	*Frankliniella minuta*	minute flower thrips	yes	yes	no	quarantine pest	yes	methyl bromide fumigation, standard phytosanitary procedures
69	*Frankliniella occidentalis*	western flower thrips	yes	yes	yes (official control in South Australia, Victoria, Tasmania, Western Australia and Northern Territory)	quarantine pest	yes	methyl bromide fumigation, standard phytosanitary procedures
70	*Frankliniella tritici*	eastern flower thrips	yes	yes	no	quarantine pest	no	
71	*Glyptoscelis squamulata*	grape bud beetle	yes	yes	no	quarantine pest	no	
72	*Graphocephalaatro punctata*	blue-green sharpshooter	yes	yes	no	quarantine pest	no	
73	*Harrisina americana*	grape leaf skeletonizer	yes	no	no	quarantine pest	no	
74	*Harrisina brillians*	western grape leaf skeletonizer	yes	yes	no	quarantine pest	yes (primary leaf feeder, but attacks clusters)	methyl bromide fumigation, standard phytosanitary procedures
75	*Hemiberlesia rapax*	greedy scale	yes	yes	yes	non-quarantine pest	no	
76	*Henosepilachna dorycae*	lady bird beetle	yes	yes	no	non-quarantine	no	

Species[1]		Common Name	Present in USA	California	Present in Australia	Australian Quarantine Status	Present on Pathway[2] (fruit)	Quarantine Risk Management Required
						pest		
77	*Heterotermes aureus*	subterranean termite	yes	yes	no	quarantine pest	no	
78	*Hoplia callipyge*	hoplia beetle	yes	yes	yes	non-quarantine pest	no	
79	*Hyles lineata*	whitelined sphinx moth	yes	yes	yes	non-quarantine pest	no	
80	*Hyphantria cunea*	American white moth (full web worm)	yes	yes	no	quarantine pest	no	
81	*Icerya purchasi*	cottony cushion scale	yes	yes	yes	non-quarantine pest	no	
82	*Incisitermes minor*	western drywood termite	yes	yes	no	quarantine pest	no	
83	*Iridomyrmex humilis*	Argentine ant	yes	yes	yes	non-quarantine pest	no	
84	*Jacobiasca lybica*	leafhopper	yes	no	no	quarantine pest	no	
85	*Lasioptera vitis*	grape tomato gall midge	yes	no	no	quarantine pest	no	
86	*Lecanium corni*	European fruit lecanium scale	yes	yes	no	quarantine pest	no	
87	*Lepidosaphes ulmi*	oyster shell scale	yes	yes	yes	non-quarantine pest	no	
88	*Limonius canus*	click beetle (pacific coast wireworm)	yes	yes	no	quarantine pest	no	
89	*Macrodactylus subspinosus*	rose chafer	yes	no	no	quarantine pest	no	
90	*Margarodes meridionalis*	ground pearls	yes	yes	no	quarantine pest	no	
91	*Melalqus confertus*	branch & twig borer	yes	yes	no	quarantine pest	no	
92	*Melanoplus devastator*	devastating grasshopper	yes	yes	no	quarantine pest	no	
93	*Metoponium abnorme*	black beetle	yes	yes	no	quarantine pest	no	
94	*Myzus persicae*	green peach aphid	yes	yes	yes	non-quarantine pest	no	
95	*Nysius raphanus*	false chinch bug	yes	yes	no	quarantine pest	no	
96	*Oedaleonotus enigma*	valley grasshopper	yes	yes	no	quarantine pest	no	
97	*Orthodes rufula*	brassy cutworm	yes	yes	no	quarantine pest	no	
98	*Oryzaephilus surinamensis*	sawtoothed grain beetle	yes	yes	yes	non-quarantine pest	no	

Species[1]		Common Name	Present in USA	Present in California	Present in Australia	Australian Quarantine Status	Present on Pathway[2] (fruit)	Quarantine Risk Management Required
99	*Otiorhynchus cribricollis*	apple weevil	yes	yes	yes	non-quarantine pest	no	
100	*Otiorhynchus sulcatus*	black vine weevil	yes	yes	yes	non-quarantine pest	no	
101	*Paracotalpa ursina*	little bear beetle	yes	yes	no	quarantine pest	no	
102	*Paraneotermes simplicicornis*	desert dampwood termite	yes	yes	no	quarantine pest	no	
103	*Parlatoria oleae*	olive scale	yes	yes	yes	non-quarantine pest	no	
104	*Parthenolecanium corni*	European fruit lecanium scale	yes	yes	no	quarantine pest	no	
105	*Parthenolecanium persicae*	European peach scale (grapevine scale)	yes	yes	yes	non-quarantine pest	yes	
106	*Parthenolecanium pruinosum*	frosted scale	yes	yes	yes	non-quarantine pest	no	
107	*Pelidnota punctata*	grapevine beetle	yes	no	no	quarantine pest	no	
108	*Peridroma saucia*	variegated cutworm	yes	yes	no	quarantine pest	no	
109	*Platynota stultana*	omnivorous leaf roller	yes	yes	no	quarantine pest	yes	methyl bromide fumigation, standard phytosanitary procedures
110	*Platypedia minor*	minor cicada	yes	yes	no	quarantine pest	no	
111	*Plodia interpunctella*	Indianmeal moth	yes	yes	yes	non-quarantine pest	no	
112	*Polychrosis viteana* (Syn : *Endopisa viteana*)	grape berry moth (American vine moth)	yes	no	no	quarantine pest	no	
113	*Popilia japonica*	Japanese beetle	yes	no	no	quarantine pest	no	
114	*Pseudococcus affinis*	obscure mealy bug	yes	yes	yes	non-quarantine pest	yes	
115	*Pseudococcus calceolariae*	citrophilus mealy bug	yes	yes	yes	non-quarantine pest	yes	
116	*Pseudococcus longispinus*	long tailed mealy bug	yes	yes	yes	non-quarantine pest	yes	
117	*Pseudococcus maritimus*	grapevine mealy bug	yes	yes	no	quarantine pest	yes	methyl bromide fumigation, standard phytosanitary procedures

Species[1]		Common Name	Present in USA	Present in California	Present in Australia	Australian Quarantine Status	Present on Pathway[2] (fruit)	Quarantine Risk Management Required
118	*Pulvinaria innumerablis*	cottony maple scale	yes	yes	no	quarantine pest	no	
119	*Pulvinaria vitis*	cottony maple scale	yes	yes	no	quarantine pest	no	
120	*Quadraspidiotus juglansregiae*	walnut scale	yes	yes	no	quarantine pest	no	
121	*Quadraspidiotus perniciosus*	San Jose scale	yes	yes	yes	non-quarantine pest	no	
122	*Reticulitermes hesperus*	western subterranean termite	yes	yes	no	quarantine pest	no	
123	*Rhizoecus falcifer*	ground root mealy bug	yes	yes	no	quarantine pest	no	
124	*Rhizoecus kondonis*	ground root mealy bug	yes	yes	no	quarantine pest	no	
125	*Saissetia oleae*	black scale	yes	yes	yes	non-quarantine pest	no	
126	*Scaphoideus* spp.	leafhopper	yes	yes	no	quarantine pest	no	
127	*Schistocerca alutacea shoshone*	green valley grasshopper	yes	yes	no	quarantine pest	no	
128	*Schistocerca nitens nitens*	vagrant grasshopper	yes	yes	no	quarantine pest	no	
129	*Scirtothrips citri*	California citrus thrips	yes	yes	no	quarantine pest	yes	methyl bromide fumigation, standard phytosanitary procedures
130	*Solenopsis xyloni*	California fire ant	yes	yes	no	quarantine pest	no	
131	*Spodoptera exiqua*	beet (lesser) army worm	yes	yes	no	quarantine pest	no	
132	*Spodoptera praefica*	western yellow striped army worm	yes	yes	no	quarantine pest	no	
133	*Spissistilus festinus*	three-cornered alfalfa hopper	yes	yes	no	quarantine pest	no	
134	*Trialeurodes vaporariorum*	greenhouse whitefly	yes	yes	no	quarantine pest	no	
135	*Trialeurodes vittatus*	grape whitefly	yes	yes	no	quarantine pest	no	
136	*Vitacea polistiformis*	grape root borer	yes	yes	no	quarantine pest	no	
137	*Zygnidia artvinicus*	leafhopper	yes	no	no	quarantine pest	no	
MITES								
1	*Brevipalpus californicus*	bunch mite	yes	yes	yes	non-quarantine pest	yes	
2	*Brevipalpus lewisi*	bunch mite, citrus flat mite	yes	yes	yes	non-quarantine pest	yes	
3	*Calepitrimerus vitis*	grapeleaf rust mite	yes	yes	yes	non-quarantine	yes	

Species[1]		Common Name	Present in USA	California	Present in Australia	Australian Quarantine Status	Present on Pathway[2] (fruit)	Quarantine Risk Management Required
						pest		
4	*Colomerus vitis strain a*	grapeleaf blister mite	yes	yes	yes	non-quarantine pest	yes	
5	*Colomerus vitis strain b*	grapeleaf bud mite	yes	yes	yes	non-quarantine pest	yes	
6	*Colomerus vitis strain c*	grapeleaf bud mite	yes	yes	no	quarantine pest	yes	methyl bromide fumigation, standard phytosanitary procedures
7	*Eotetranychus willametti*	willamette spider mite	yes	yes	no	quarantine pest	yes	methyl bromide fumigation, standard phytosanitary procedures
8	*Eotetranychus carpini (Syn:Tetranychus flavus)*	hornbeam mite	yes	yes	no	quarantine pest	yes	methyl bromide fumigation, standard phytosanitary procedures
9	*Tetranychus pacificus*	Pacific spider mite	yes	yes	no	quarantine pest	yes	methyl bromide fumigation, standard phytosanitary procedures
10	*Tetranychus urticae*	two-spotted mite	yes	yes	yes	non-quarantine pest	yes	
FUNGI								
1	*Alternaria* spp.	raisin mould, bunch rot	yes	yes	yes	non-quarantine pest	yes	
2	*Alternaria tenuis*	grape rot	yes	yes	yes	non-quarantine pest	yes	
3	*Anthostomella pullulans*	brulure	yes	yes	yes	non-quarantine pest	no	
4	*Armillaria mellea*	*Armillaria* or shoe string root rot	yes	yes	no	quarantine pest	no	
5	*Ascochyta* spp.	bunch rot	yes	yes	yes	non-quarantine pest	yes	
6	*Aspergillus aculeatus*	bunch rot	yes	yes	yes	non-quarantine pest	yes	
7	*Aspergillus niger*	bunch rot	yes	yes	yes	non-quarantine pest	yes	

Species[1]		Common Name	Present in USA	California	Present in Australia	Australian Quarantine Status	Present on Pathway[2] (fruit)	Quarantine Risk Management Required
8	*Asperisporium minutulum*	leaf spot	yes	yes	no	quarantine pest (occurs only on *Vitis californica*)	no	
9	*Botryosphaeria dothidea*	Botryosphaeria rot and necrosis (macrophoma rot)	yes	yes	yes	non-quarantine pest	yes	
10	*Botryosphaeria stevensii*	black dead arm	yes	no	yes	quarantine pest	no	
11	*Botrytis cinerea*	Botrytis bunch rot or grey mould	yes	yes	yes	non-quarantine pest	yes	
12	*Briosia ampelophaga*	leaf blotch	yes	no	no	quarantine pest	no	
13	*Cephalosporium* spp.	wood rot (black measles)	yes	yes	no	quarantine pest	no	
14	*Cladosporium herbarum*	Cladosporium rot (harvest mould)	yes	yes	yes	non-quarantine pest	yes	
15	*Cladosporium viticola*	Cladosporium leaf spot	yes	no	no	quarantine pest	no	
16	*Colletotrichum gloeosporioides*	ripe rot	yes	yes	yes	non-quarantine pest	yes	
17	*Coniella diplodiella*	white rot	yes	no	yes	non-quarantine pest	no	
18	*Cristulariella moricola*	zonate leaf spot (target spot)	yes	no	no	quarantine pest	no	
19	*Didymosphaeria sarmentii*	eutypa canker gummosis	yes	yes	no	quarantine pest	no	
20	*Diplodia natalensis*	Diplodia cane die-back	yes	yes	yes	non-quarantine pest	no	
21	*Elsinoe ampelina*	anthracnose and bird's eye rot (black rot)	yes	no	yes (not in Northern Territory)	non-quarantine pest	no	
22	*Eutypa lata*	Eutypa die back	yes	yes	yes	non-quarantine pest	no	
23	*Fusarium* spp.	Fusarium root rot	yes	yes	yes	non-quarantine pest	no	
24	*Glomerella cingulata*	ripe rot	yes	yes	yes	non-quarantine pest	yes	
25	*Greeneria uvicola*	bitter rot	yes	no	yes	non-quarantine pest	yes	
26	*Guignardia bidwellii*	black rot	yes	no	no	quarantine pest	no	
27	*Helminthosporium* spp.	bunch rot	yes	yes	yes	non-quarantine pest	yes	

Species[1]		Common Name	Present in USA	Present in California	Present in Australia	Australian Quarantine Status	Present on Pathway[2] (fruit)	Quarantine Risk Management Required
28	*Metschnikowia pulcherrima*	autumn leaf spot	yes	yes	no	quarantine pest	no	
29	*Monilinia fructicola*	bunch rot	yes	no	yes	non-quarantine pest	yes	
30	*Mycosphaerella angulata*	angular leaf spot of muscadines	yes	no	no	quarantine pest	no	
31	*Mycosphaerella personata*	leaf blight (isariopsis leaf spot)	yes	yes	yes	non-quarantine pest	no	
32	*Penicillium* spp.	bunch rot (blue mould)	yes	yes	yes	non-quarantine pest	yes	
33	*Phaeoramularia heterospora*	leaf spot	yes	yes	no	quarantine pest	no	
34	*Phellinus igniarius*	esca wood rot (black measles)	yes	yes	no	quarantine pest	no	
35	*Phoma vitis*	fruit rot	yes	yes	yes	non-quarantine pest	yes	
36	*Phomopsis viticola*	*Phomopsis* cane and leaf spot (grape dead arm)	yes	yes	yes (except Tasmania)	non-quarantine pest	no	
37	*Phyllosticta spermoides*	leaf spot	yes	yes	no	quarantine pest	no	
38	*Phymatotrichopsis omnivora*	phymatotrichum root rot (cotton root rot)	yes	yes	no	quarantine pest	no	
39	*Physopella ampelopsidis*	rust	yes	no	no	quarantine pest	no	
40	*Phytophthora cinnamomi*	crown and root rot	yes	yes	yes	non-quarantine pest	no	
41	*Phytophthora citricola*	*Phytophthora* crown and root rot	yes	yes	no	quarantine pest	no	
42	*Phytophthora megasperma*	Phytophthora crown and root rot	yes	yes	yes	non quarantine pest	no	
43	*Plasmopara viticola*	grape downy mildew	yes	yes (in wild *Vitis* species)	yes (official control - Western Australia)	quarantine pest	no	
44	*Pseudopezicula tetraspora*	angular leaf scorch	yes	no	no	quarantine pest	no	
45	*Pseudopezicula tracheiphila*	rot brenner	yes	no	no	quarantine pest	no	
46	*Pyrenochaeta vitis*	leaf spot	yes	no	no	quarantine pest	no	
47	*Pythium aphanidermatu-m*	root rot	yes	yes	yes	non-quarantine pest	no	

Species[1]		Common Name	Present in USA	Present in California	Present in Australia	Australian Quarantine Status	Present on Pathway[2] (fruit)	Quarantine Risk Management Required
48	*Rhizopus* spp.	bunch rot	yes	yes	yes	non-quarantine pest	yes	
49	*Rhytisma vitis*	tar spot	yes	no	no	quarantine pest	no	
50	*Rhyzopus arrhizus*	fruit rot	yes	yes	no	non-quarantine pest	yes	
51	*Roesleria subterranea*	grape root rot (*Roesleria* root rot)	yes	no	no	quarantine pest	no	
52	*Sclerotinia sclerotiorum*	shoot blight (fruit green rot)	yes	yes	yes	non-quarantine pest	no	
53	*Sclerotium rolfsii*	collar rot	yes	yes	yes	non-quarantine pest	no	
54	*Septoria ampelina*	septoria leaf spot	yes	no	no	quarantine pest	no	
55	*Stemphylium botryosum*	bunch rot	yes	yes	yes	non-quarantine pest	yes	
56	*Stereum hirsutum*	black measle esca	yes	yes	yes	non-quarantine pest	no	
57	*Thielaviopsis basicola*	black root rot	yes	yes	yes	non-quarantine pest	no	
58	*Torula* spp.	bunch rot	yes	yes	yes	non-quarantine pest	yes	
59	*Uncinula necator*	powdery mildew or oidium	yes	yes	yes	non-quarantine pest	yes	
60	*Verticillium dahliae*	verticillium wilt	yes	yes	yes	non-quarantine pest	no	
BACTERIA								
1	*Agrobacterium tumefaciens*	crown gall	yes	yes	yes	non-quarantine pest	no	
2	*Agrobacterium vitis*	crown gall	yes	yes	yes	non-quarantine pest	no	
3	*Xylella fastidiosa*	Pierce's disease	yes	yes	no	quarantine pest	no	
VIRUSES								
1	Alfalfa mosaic *alfamovirus*	alfalfa mosaic virus	yes	yes	yes	non-quarantine pest	no	
2	Bratislava mosaic virus	bratislava mosaic virus	yes	no	no	quarantine pest	no	
3	Broad bean wilt *fabavirus*	broad bean wilt virus	yes	yes	yes	non-quarantine pest	no	
4	Grapevine corky bark-associated	corky bark virus	yes	yes	yes	non-quarantine	no	

Species[1]		Common Name	Present in USA	Present in California	Present in Australia	Australian Quarantine Status	Present on Pathway[2] (fruit)	Quarantine Risk Management Required
	closterovirus					pest		
5	Grapevine fan leaf *nepovirus* (GFLV)	fan leaf virus	yes	yes	yes	non-quarantine pest	no	
6	Tomato ring spot *nepovirus* (TRSV)	grape yellow vein virus	yes	yes	yes	non-quarantine pest	no	
7	Grapevine fleck virus	grapevine fleck virus	yes	no	yes	non-quarantine pest	no	
8	Grapevine stunt virus	grapevine stunt virus	yes	yes	no	quarantine pest	no	
9	Grapevine leafroll associated *closterovirus 1*	grapevine leafroll associated closterovirus 1	yes	yes	yes	non-quarantine pest	no	
10	Grapevine leafroll associated *closterovirus 2*	grapevine leafroll associated closterovirus 2	yes	yes	yes	non-quarantine pest	no	
11	Grapevine leafroll associated *closterovirus 3*	grapevine leafroll associated closterovirus 3	yes	yes	yes	non-quarantine pest	no	
12	Grapevine leafroll associated *closterovirus 4*	grapevine leafroll associated closterovirus 4	yes	yes	yes	non-quarantine pest	no	
13	Grapevine leafroll associated *closterovirus 5*	grapevine leafroll associated closterovirus 5	yes	yes	yes	non-quarantine pest	no	
14	Grapevine leafroll associated *closterovirus 6*	grapevine leafroll associated closterovirus 6	yes	yes	yes	non-quarantine pest	no	
15	Grapevine leafroll associated *closterovirus 7*	grapevine leafroll associated closterovirus 7	yes	yes	yes	non-quarantine pest	no	
16	Grapevine leafroll associated *closterovirus 8*	grapevine leafroll associated closterovirus 8	yes	yes	yes	non-quarantine pest	no	
17	Joannes seyve virus	Joannes seyve virus	yes	no	no	quarantine pest	no	
18	Sowbane mosaic *sobemovirus*	sowbane mosaic virus	yes	yes	yes	non-quarantine pest	no	
19	Tobacco mosaic *tobamovirus*	tobacco mosaic virus	yes	no	yes	non-quarantine pest	no	
20	Tobacco necrosis *necrovirus*	tobacco necrosis virus	yes	yes	yes	non-quarantine pest	no	
American nepoviruses								

Species[1]		Common Name	Present in USA	Present in California	Present in Australia	Australian Quarantine Status	Present on Pathway[2] (fruit)	Quarantine Risk Management Required
21	Blueberry leaf mottle *nepovirus*	blueberry leaf mottle virus	yes	no	no	quarantine pest	no	
22	Peach rosette mosaic *nepovirus*	peach rosette mosaic virus	yes	no	no	quarantine pest	no	
23	Tobacco ringspot *nepovirus*	tobacco ringspot virus	yes	yes	yes	non-quarantine pest	no	
24	Tomato ringspot *nepovirus*	tomato ringspot virus decline	yes	yes	yes	non-quarantine pest	no	
European nepoviruses								
25	Arabis mosaic *nepovirus*	arabis mosaic virus	yes	no	yes	non-quarantine pest	no	
26	Grapevine bulgarian latent *nepovirus*	grapevine bulgarian latent (GBLV) virus	yes	no	no	quarantine pest	no	
27	Raspberry ringspot *nepovirus*	raspberry ringspot virus	yes	no	no	quarantine pest	no	
28	Strawberry latent ringspot *nepovirus*	strawberry latent ringspot virus	yes	no	yes	non-quarantine pest	no	
29	Tomato black ring *nepovirus*	tomato black ring virus	yes	no	no	quarantine pest	no	
VIRUS LIKE DISORDERS								
1	Asteroid mosaic (virus like)	asteroid mosaic	yes	yes	no	quarantine pest	no	
2	Enation disease (virus like)	enation	yes	no	yes	non-quarantine pest	no	
3	Rupestris stem pitting (virus like)	rupestris stem pitting (legno riccio)	yes	yes	yes	non-quarantine pest	no	
4	Vein necrosis (virus like)	vein necrosis	yes	yes	yes	non-quarantine pest	no	
VIROIDS								
1	Australian grapevine viroid (AGVd)	Australian grapevine viroid	yes	yes	yes	non-quarantine pest	no	
2	Citrus exocortis viroid (CEVd-g)	citrus exocortis A viroid	yes	yes	yes	non-quarantine pest	no	
3	Grapevine viroid cucumber (GVd-c)	grapevine viroid cucumber	yes	yes	no	quarantine pest	no	
4	Grape vine yellow speckle I (GYSVd-1)	grape vine yellow speckle I viroid	yes	yes	yes	non-quarantine pest	no	
5	Grape vine yellow speckle 2 (GYSVd-2)	grape vine yellow speckle 2 viroid	yes	yes	yes	non-quarantine pest	no	
6	Hop stunt viroid (AGVd)	hop stunt viroid	yes	yes	yes	non-quarantine pest	no	

Species[1]		Common Name	Present in USA	Present in California	Present in Australia	Australian Quarantine Status	Present on Pathway[2] (fruit)	Quarantine Risk Management Required
PHYTOPLASMAS (formerly mycoplasma like organisms)								
1	Phytoplasma	flavescence doree'	yes	no	no	quarantine pest	no	
2	Phytoplasma	grapevine yellows	yes	no	yes (official control - Western Australia)	quarantine pest	no	
NEMATODES								
1	*Criconemella xenoplax*	ring nematode	yes	yes	yes	non-quarantine pest	no	
2	*Helicotylenchus* spp.	spiral nematode	yes	yes	yes	non-quarantine pest	no	
3	*Hemicycliophora* spp.	sheath nematode	yes	yes	yes	non-quarantine pest	no	
4	*Longidorus breviannulatus*	needle nematode	yes	no	no	quarantine pest	no	
5	*Macroposthonia xenoplax*	ring nematode	yes	yes	yes	non-quarantine pest	no	
6	*Meloidogyne arenaria*	root-knot nematode	yes	no	yes	non-quarantine pest	no	
7	*Meloidogyne hapla*	root-knot nematode	yes	no	yes	non-quarantine pest	no	
8	*Meloidogyne incognita*	root-knot nematode	yes	no	yes	non-quarantine pest	no	
9	*Meloidogyne javanica*	root-knot nematode	yes	no	yes	non-quarantine pest	no	
10	*Paratrichodorus minor*	stubby root nematode	yes	yes	yes	non-quarantine pest	no	
11	*Pratylenchus vulnus*	root-lesion nematode	yes	yes	yes	non-quarantine pest	no	
12	*Tylenchulus semipenetrans*	citrus nematode	yes	yes	yes	non-quarantine pest	no	
13	*Xiphinema americanum*	dagger nematode	yes	yes	yes	non-quarantine pest	no	
14	*Xiphinema index*	dagger nematode	yes	yes	yes	non-quarantine pest	no	

1 The presence of pests in the USA and California was obtained via relevant scientific publications and personal communication with scientific experts as documented in the Pest Risk Analysis (PRA) paper.

2 Any means that allows the entry or spread of a pest.

In addition to the information summarised in Table 1, APHIS has provided AQIS with survey data to show that *Ceratitis capitata* (medfly), *Craponius inaequalis* (grape curculio), *Eulithis diversilineata* (grape looper), *Fidia viticida* (grape root worm), *Guignardia bidwellii* (black rot), *Mycosphaerella angulata* (angular leaf spot), *Physopella ampelopsidis* (rust), *Polychrosis viteana* (grape berry moth) and *Pseudopezicula tetraspora* (angular leaf scorch) are not present in California and therefore these pests have not been included in the pathway. AQIS would require immediate notification of any changes in the status (fresh incursions, outbreaks etc.) of these pests and diseases in California as a condition for import.

Similarly, if any fruit fly species in addition to *Ceratitis capitata* (medfly) is detected, APHIS would be required to advise AQIS immediately, and if economically significant to Australia, trade would be suspended immediately pending the outcome of an investigation.

6. OTHER ASSESSMENTS

6.1. Weed Risk Assessment of Table Grapes

The importation of fruit is also a pathway for the introduction of grape seed. Although species of *Vitis* such as *V. aestivalis, V. candicans, V. hastata, V. rotundifolia; V. trifolia* and *V. vulpina* are recorded as weeds in parts of the world such as China, India, Japan and USA, there are no records of *Vitis vinifera* as a weed. *Vitis vinifera* has been assessed using the Weed Risk Assessment System of AQIS to determine its potential weediness and has been determined as being of no quarantine concern.

6.2. Weed Seed Contamination of Table Grape Imports

There is a potential for table grapes for export to contain exotic weed seeds of quarantine concern to Australia. This is due to the grape clusters being contaminated by the seeds of plants growing in the rows. Such weed seeds include *Abutilon theophrasti* (velvet leaf), *Acroptilon repens* (creeping knapweed), *Amsinckia* spp. (Amsinckia), *Baccharis halimifolia* (*Baccharis*), *Cenchrus* spp. (grass), *Chamomilla suaveolens* (pineapple weed), *Chondrilla juncea* (skeleton weed), *Convolvulus arvensis* (field bindweed), *Eragrostris curvula* (African love grass), *Lycium* spp. (boxthorn), *Pennisetum alopecuroides* (Chinese *pennisetum*), *Pennisetum polystachion* (mission grass), *Phragmites* spp., *Solanum elaeagnifolium* (silverleaf nightshade), *Solanum sarrachoides* (hairy nightshade), *Sorghum almum* (Columbus grass), *Sorghum halepense* (Johnson grass), *Toxicodendron diversilobum* (Pacific poison-oak), *Tribulus* spp. (caltrop) and *Xanthium* spp. (bur). Table grapes for export to Australia would therefore need to be inspected and found to be free of the above mentioned weed species. Any grapes found to be contaminated with any of these weed seeds would be treated on-arrival in Australia and if no treatment is available then the affected table grapes would be reshipped or destroyed at the expense of the importer.

6.3. Environmental Impact

AQIS is satisfied that the importation of table grapes from California in the United States of America under the conditions specified later in this document would present negligible risk to the environment and accordingly that obligations arising from the Administrative Procedures made under the Environment Protection (Impact of Proposals) Act 1974 have been met.

7. SUMMARY OF POTENTIAL QUARANTINE PESTS

The PRA took into account factors such as the biology, host range, distribution, entry potential, establishment potential, spread potential and economic damage potential of the pests and diseases that may be associated with table grapes in California. This section of the draft IRA paper mainly details the species of pests of quarantine concern identified in the PRA paper.

Sixteen insect pests of quarantine concern were identified to be associated with the fruit entry pathway of table grapes from California. Of those, one quarantine pest is under official control in Australia.

The arthropods of concern associated with table grapes from California are: *Amyelois transitella* (navel orangeworm), *Argyrotaenia citrana* (orange tortrix), *Caliothrips fasciatus* (bean thrips), *Colomerus vitis* - strain c (grapeleaf bud mite-leaf curl strain), *Desmia funeralis* (grape leaffolder), *Drepanothrips reuteri* (eastern flower thrips), *Eotetranychus carpini* (hornbeam mite), *Eotetranychus willamettei* (Willamette spider mite), *Estigmene acrea* (salt marsh caterpillar), *Frankliniella minuta* (minute flower thrips), *Frankliniella occidentalis* (western flower thrips), *Harrisinia brillians* (western grape leaf skeletoniser), *Platynota stultana* (omnivorous leaf roller), *Pseudococcus maritimus* (grapevine mealy bug), *Scirtothrips citri* (California citrus thrips) and *Tetranychus pacificus* (Pacific spider mite).

Panonychus ulmi (European red mite) is present in California on deciduous fruits but has not been reported on *Vitis vinifera* in California. This is a destructive pest of quarantine concern as it has been reported to have a wide host range and it infests grapes in other countries. *Scirtothrips persea* (Californian thrips) is a thrips which has been reported to cause damage to avocado fruit in California. It is believed that this thrips could also attack cherries, citrus, grapes, persimmons and strawberries. AQIS is not aware that this pest has been recorded on grapes in California. If these two above mentioned pests are detected on grapes in California APHIS would have to inform AQIS of such findings for further consideration.

Daktulosphaira vitifoliae (grape phylloxera) is an aphid-like insect that attacks grape roots and causes stunted growth and vine death. Grape phylloxera have been found throughout California's

grape-growing areas except for southern Californian counties. Only the root feeding form is present in Califonia but not the leaf feeding form. The insect is thought to spread on infested cuttings, rootings and on other items (stakes, boxes, tyres, shoes). As newly hatched phylloxera nymphs can live out of the soil for only 3 days this insect is deemed to be of negligible quarantine risk.

Xylella fastidiosa (causal agent of Pierce's disease) is another major disease which does not occur in Australia but is present in California. However, this disease is not associated with the fruit entry pathway and is not considered as a quarantine pest on fruit. The causal agent is a bacterium limited to the xylem of grapevine and is transmitted by leafhoppers known as sharpshooters. *Carnocephala fulgida* (red-headed sharpshooter), *Draeculacephala minerva* (green sharpshooter) and *Graphocephala atropunctata* (blue-green sharpshooter), are the primary vectors of this disease in California.

Research required by AQIS and conducted by Purcell[♦] in 1992, demonstrated that there was no evidence that sharpshooters could acquire the bacterium by feeding on grape clusters. Purcell also showed that none of the sharpshooters are able to withstand the low storage temperatures (1–3°C) of grape shipments.

Another arthropod, which is known to be associated with California table grapes, is *Lactrodectus mactans* (black widow spider). Whilst this is not deemed to be a quarantine pest of grapes, it is a venomous spider which may occur within the bunch. This spider could be controlled in table grape shipments by pre-export inspection and methyl bromide fumigation.

There are no major risks associated with grape diseases provided that exports are free from trash. Trash refers to twigs, splinters, leaves, soil or other plant material that is lopped off the grapevine during harvest. Rachises, peduncles and pedicels attached to the grape bunches are not considered as trash, but would need to be pest and disease free.

The PRA identified that *Plasmopara viticola* (grape downy mildew) has only been recorded to infest the wild grape species *Vitis californica* in the mountains in California in 1958. It has not been reported on the commercial *Vitis* species and cultivars in the grape growing areas in California. Its restricted occurrence has been attributed to the absence of rainfall in spring and summer which limits the spread of the disease in California. *Plasmopara viticola* is thus not deemed to be of quarantine concern. In addition, the disease occurs in the major grape growing areas in Australia although it is under official control in Western Australia.

Specific risk management options that may address each of the high risk pests and provide adequate quarantine security are reviewed in the following sections.

8. SUMMARY OF QUARANTINE PESTS AND DISEASES WITH POTENTIAL RISK OF ENTRY ON FRESH TABLE GRAPES FROM CALIFORNIA INTO AUSTRALIA

Insects :

1. *Amyelois transitella* (navel orangeworm)
2. *Argyrotaenia citrana* (orange tortrix)
3. *Caliothrips fasciatus* (bean thrips)
4. *Colomerus vitis - strain c* (grapeleaf bud mite-leaf curl strain)
5. *Desmia funeralis* (grape leaffolder)

♦ Purcell, A.H. (1992). Report of research: Infectivity of harvested grape clusters for Pierce's disease spread. Department of Entomological Sciences, University of California, Berkeley, 10 pp.

6. *Drepanothrips reuteri* (eastern flower thrips)
7. *Eotetranychus carpini* (hornbeam mite)
8. *Eotetranychus willamettei* (willamette spider mite)
9. *Estigmene acrea* (salt marsh caterpillar)
10. *Frankliniella minuta* (minute flower thrips)
11. *Frankliniella occidentalis* (western flower thrips)
12. *Harrisina brillians* (western grape leaf skeletoniser)
13. *Platynota stultana* (omnivorous leaf roller)
14. *Pseudococcus maritimus* (grapevine mealy bug)
15. *Scirtothrips citri* (California citrus thrips)
16. *Tetranychus pacificus* (Pacific spider mite)

9. PROPOSED OPTIONAL CONDITIONS FOR IMPORT

Any agreement to import table grapes (*Vitis vinifera* L.) from California would require that:

1. A Specific Commodity Understanding (SCU) document would be prepared between AQIS and APHIS setting out an agreed set of quarantine conditions and operational procedures. Before imports would commence, any subsequent change in import requirements would require the development of an amendment to the SCU.
2. The conditions for import would have to be reviewed at the end of the first year of trade.

In the absence of any novel and effective method of phytosanitary treatment, methyl bromide fumigation presents the principal and only reliable quarantine treatment available for disinfestation purposes. The fumigation rates as specified on page 52 are in line with the AQIS Standard for Fumigation with Methyl Bromide (1994).

A range of phytosanitary measures to manage the risk of insect pests of table grapes which are of quarantine concern to Australia are summarised in Table 2.

Table 2. Phytosanitary risk management measures for quarantine pests of table grapes

Quarantine Pest	Common Name(s)	Risk Management Options	
		Option A	Option B
Amyelois transitella *Argyrotaenia citrana* *Caliothrips fasciatus* *Colomerus vitis* strain c *Desmia funeralis*	navel orangeworm orange tortrix bean thrips grape bud mite strain c grape leaffolder	• Pre-fumigation inspection • Freedom from weed	• Pre-export inspection • Freedom from weed seeds • Freedom from

Drepanothrips reuteri *Eotetranychus carpini* *Eotetranychus willamettei* *Estigmene acrea* *Frankliniella minuta* *Frankliniella occidentalis* *Harrisinia brillians* *Platynota stultana* *Pseudococcus maritimus* *Scirtothrips citri* *Tetranychus pacificus*	eastern flower thrips hornbeam mite Willamette spider mite salt marsh caterpillar minute flower thrips western flower thrips western grape leaf skeletonizer omnivorous leaf roller grapevine mealy bug California citrus thrips Pacific spider mite	seeds • Freedom from soil and trash • Pre-shipment fumigation • On arrival inspection	soil and trash • On arrival fumigation • Post-fumigation inspection

9.1. Option A - Pre-shipment (Off-Shore) Fumigation

Option A which incorporates pre-shipment fumigation, is the preferred approach of AQIS to mitigate risks of pests of quarantine concern that could be introduced into Australia. This option would be allowed throughout the full season of export of table grapes from California into Australia.

Item 1. Pre-fumigation inspection by APHIS

This would have to focus on the quarantine pests listed in Table 2 and those pests of quarantine concern for which APHIS has provided area freedom status based on their survey data in California. Additional inspection for freedom from trash and weed seeds would also be required. Table grapes for Australia would need to be stored separately from grapes destined for domestic markets at all times and would need to be transported to registered export centres before inspection. Table grapes in boxes would be identified by vineyard number. All inspections and sampling would need to be based on the number of boxes of grapes that are fumigated as a 'lot'.

A 'lot' consists of all table grape fruit treated for export to Australia on one day from one registered treatment facility. A 'lot' passes or fails on the results of each inspection. The selection of cartons from each 'lot' for sampling would be random. A number of 'lots' may constitute a consignment. A consignment is the number of cartons of table grapes shipped from one port in California to a designated port in Australia for one consignee on the same vessel on the same day. The sample size of cartons and fruit bunches to be inspected would be agreed between APHIS and AQIS before the commencement of import via a Specific Commodity Understanding (SCU) document.

Item 2. Pre-shipment (off-shore) fumigation with methyl bromide

- Fumigation of fruit in gas permeable packaging would need to be conducted in California. This would be done soon after fruit are field packed and prior to cold storage.
- Fumigation would have to be with methyl bromide for a duration of 2 hours according to the specifications below and supervised by APHIS.

  32g/m³ at a grape pulp temperature of 21°C or greater;

  40g/m³ at a grape pulp temperature of 16°C or greater but less than 21°C;

  48g/m³ at a grape pulp temperature of 11°C or greater but less than 16°C.

- The loading ratio would not exceed 67%. Fruit is not to be fumigated if the grape pulp temperature is below 11°C.

AQIS would reserve the right to seek suspension of fumigation facilities under the off-shore fumigation (option A) if any live insects listed in Section 8, including eggs and pupae, were detected during on-arrival inspections.

All pre-shipment (off-shore) fumigation certificates would need to contain the following fumigation details:

(a). the name of the fumigation facility,

(b). APHIS registration number of the facility,

(c). the date of fumigation,

(c). the concentration of methyl bromide (g/m^3),

(d). the fumigation duration,

(e). the grape pulp temperature during fumigation (°C).

Item 3. On-arrival inspection after pre-shipment (off-shore) fumigation with methyl bromide

In the event of live pests being found at inspection on-arrival, the pre-shipment fumigation facility would be suspended and no fumigations would be permitted to be undertaken by that facility until the cause of the fumigation failure was determined by APHIS and corrective action implemented.

All live pests detected on-arrival would have to be identified to species level by AQIS technical specialists and this information forwarded to APHIS. Any 'lot' found to be infested with live pests would be isolated from other export grapes and re-fumigated, re-exported or destroyed. Remaining 'lots' of table grapes from the same fumigation facility would be targetted for careful inspection in Australia, and if found to be infested would be re-fumigated, re-exported or destroyed pending confirmation of the identity of the pest.

Remaining grapes in the consignment from other fumigation facilities would be reinspected. A fumigation facility from which grapes are rejected would be permitted to resubmit further 'lots' for the current export season following advice from APHIS that corrective action had been implemented. If a second 'lot' was rejected the fumigation facility would be suspended for the remainder of the season.

If *Panonychus ulmi* (European red mite), *Scirtothrips persea* (Californian thrips) and pests requiring area freedom are detected, area freedom would be suspended immediately, and trade would cease pending the outcome of an investigation and/or corrective action.

The cost of any rejection, re-treatment, destruction or re-export of table grape shipments as a result of insect pest detection would have to be borne by the relevant exporters of such shipments.

9.2. Option B - Fumigation on arrival in Australia (July to September only)

This option would need to have equivalent security to ensure that the appropriate level of protection against pests of quarantine concern that could be introduced into Australia. Therefore, this option would be only allowed during the dormant / low risk period of insect pest activity for table grapes in Australia from July - September. Such shipments would be fumigated at selected ports of entry in Australia as designated by AQIS.

Item 1. Pre-export inspection by APHIS

This would have to focus on the quarantine pests listed in Table 2 and those pests of quarantine concern for which APHIS has provided area freedom status based on their survey data in California. Additional inspection for freedom from trash and weed seeds would also be required. Table grapes for export to Australia would need to be stored separately from grapes destined for domestic markets at all times and would need to be transported to registered export centres before inspection.

Table grapes in boxes would be identified by vineyard number. All inspections and sampling would need to be based on the number of boxes of grapes that will make up the export 'lot'. A 'lot' passes or fails on the results of each inspection.

The selection of cartons from each 'lot' for sampling for pre-export inspection would be random. The sample size of cartons and fruit bunches to be inspected would be agreed between APHIS and AQIS before the commencement of import via a Specific Commodity Understanding (SCU) document.

Item 2. Shipment period

Under this option, the shipment of table grapes would be allowed into Australia between July and September of each year.

Item 3. On-arrival fumigation with methyl bromide

Fumigation of table grapes in gas permeable packaging would need to be done on arrival in Australia. This would be done soon after grapes arrive in designated ports. Fumigation would have to be with methyl bromide for 2 hours according to the specifications below and supervised by AQIS.

32g/m³ at a grape pulp temperature of 21°C or greater;

40g/m³ at a grape pulp temperature of 16°C or greater but less than 21°C;

48g/m³ at a grape pulp temperature of 11°C or greater but less than 16°C.

The loading ratio would not exceed 67%. Fruit is not to be fumigated if the grape pulp temperature is below 11°C.

Item 4. Inspection after on-arrival fumigation in Australia

In the event of live quarantine pests being found at inspection (which is to be undertaken after fumigation) such 'lots' would be isolated from other export grapes and re-fumigated, re-exported or destroyed pending confirmation of the identity of the pest. A fumigation facility from which pests are found after fumigation would be permitted to fumigate further 'lots' for the current export season after corrective action had been implemented. If a second 'lot' was detected with pests, the fumigation facility would be suspended for the remainder of the season.

If *Panonychus ulmi* (European red mite), *Scirtothrips persea* (Californian thrips) and pests requiring area freedom are detected, area freedom would be suspended immediately, and trade would cease pending the outcome of an investigation.

The cost of any rejection, re-treatment, destruction or re-export of table grape shipments as a result of insect pest detection would have to be borne by the relevant exporters of such shipments.

10. MANDATORY REQUIREMENTS FOR IMPORT

This section describes all the phytosanitary requirements required under all the options to mitigate quarantine risks associated with the importation of table grapes into Australia.

Item 1. Registration

APHIS would be required to register all export vineyards and allocate unique vineyard registration numbers so as to enable trace back in the case of non-compliance. Maps showing the location and registration number of each export vineyard would be kept by APHIS for the purpose of identifying areas requiring pre-export inspection or pre-fumigation inspection. Fumigation facilities would also be required to register with APHIS, and would need to comply with APHIS standards for export grade facilities.

Item 2. Field packing procedures

Table grapes for export must be mature and unblemished and be free from trash, soil, weed seeds and live arthropods. Any 'lot' found to be contaminated with weed seeds listed in section 6.2 or live arthropods would be treated on-arrival in Australia and if no treatment is available then such 'lots' would be reshipped or destroyed at the expense of the importer.

Item 3. Packing and labelling

Table grapes would be packed into cartons with ventilation holes bearing labels with unique vineyard registration numbers to enable trace back. Packing of table grapes should be in new cartons and packing material would have to be synthetic or processed if of plant origin. No unprocessed packing material of plant origin such as straw is permitted.

Item 4. Phytosanitary certification

An international phytosanitary certificate would be issued for each consignment containing the following information-

- the appropriate fumigation 'lot' numbers, number of cartons per 'lot', container and seal numbers. Container number and seal numbers are mandatory for each container shipped per phytosanitary certificate.

- And an additional declaration stating **"the grapes in this consignment have met the conditions of the SCU between APHIS and AQIS for the export of fresh table grapes from California to Australia."**

Item 5. Export/storage centre

APHIS officials would have to ensure the following:

- Registered export centre facilities are maintained in a condition that would provide security against reinfestation.
- The movement of table grapes from the time of arrival at the storage premise through to the time of export would need to be recorded.
- Records of sufficient detail to allow trace back to storage house, grower and fumigator would have to be available to AQIS through APHIS if required.

Violations of any of the above requirements would result in suspension of the facility by APHIS until corrective action has been completed and AQIS agreement to the reinstatement is obtained.

Item 6. Cold storage after fumigation

APHIS inspected and cleared table grapes for export to Australia would only be stored under security and segregated from all other grapes in a cold store maintained at 1-3°C until loaded into containers. Fumigated grapes would have to be securely sealed during transportation to prevent reinfestation and the cold-chain would have to be continuously maintained throughout the duration of transit. APHIS would need to ensure that container doors are sealed after loading.

Item 7. On-arrival inspection of consignments fumigated prior to shipment (Option A) and post-fumigation inspection (Option B) in Australia

Inspection for quarantine pests would be carried out by AQIS on each 'lot' in accordance with the sampling size outlined in the SCU, which would be consistent with AQIS National Sampling Procedures. Such sampling methodology would have to provide 95% confidence that there is not more than 0.5% infestation in the 'lot'. An inspection 'lot' consists of all table grape fruit treated for export to Australia on one day from one registered treatment facility. An example of a sampling size using bunches for inspection/detection is below. An equivalent alternative would be to use cartons as the unit.

Lot size (Units)	Sample size (Units)
For lots of fruit of less than 1000 units	either a 450 unit or 100% sample
For lots of fruit of greater than 1000 units	600 unit

Unit = one bunch of grapes

All 'lots' would have to be inspected on arrival in Australia. 'Lots' fumigated on arrival would have to be inspected after fumigation is completed.

The 600 unit sample would need to be selected randomly from each 'lot'. The full 600 unit inspection would have to be performed regardless of whether a quarantine pest or potential quarantine pest is found. The entire contents would undergo visual examination, on the inspection bench, prior to samples being taken from each carton for closer inspection.

If leaf and/or extraneous matter is found, importers would be offered the options of cleaning of table grapes, re-export or destruction. If cleaning of table grapes is chosen the 'lot' would be directed to an approved quarantine premise for removal of all extraneous matter and repacking of the table grapes. Removal of extraneous matter would have to be carried out under quarantine supervision. Samples of any leaf material or other extraneous matter would be collected by inspectors and forwarded to Plant Pathologists to be tested to confirm that no pathogens of quarantine concern are present.

Once the 600 units have been chosen for inspection, each bunch would be externally examined with a hand lens using ten times magnification, paying particular attention to cracks, crevices and other faults on the grape surface. The gap between pedicel and fruit would be closely examined including the underside of the pedicel. Any grapes showing rot marks or bruising would have to be cut and examined for the presence of internal feeders.

If live pests and diseases are found, they would be submitted to the entomologist/pathologist for identification. All potential quarantine pests and/or diseases found during on-arrival inspection would need to be forwarded to the appropriate Quarantine Entomologist or Plant Pathologist for full identification prior to treatment being performed. For details of quarantine and non-quarantine pests

and diseases refer to Table 1. Any pests and diseases not listed would need to be considered as quarantine and detection advice would have to be forwarded to AQIS.

Item 8. Rejection on arrival

If live *Platynota stultana* (omnivorous leaf roller), *Pseudococcus maritimus* (grape mealy bug), thrips or mites including *Frankliniella occidentalis* (western flower thrips), *Colomerus vitis -strain c* (grapeleaf bud mite-leaf curl strain) and *Tetranychus pacificus* (Pacific spider mite) are found, AQIS would have to inform APHIS of the suspension of importation of table grapes pending investigation of the causes of infestation at relevant vineyards and appropriate remedial measures taken.

If *Ceratitis capitata* (medfly), *Craponius inaequalis* (grape curculio), *Eulithis diversilineata* (grape lopper), *Fidia viticida* (grape root worm), *Guignardia bidwellii* (black rot), *Mycosphaerella angulata* (angular leaf spot), *Physopella ampelopsidis* (rust), *Polychrosis viteana* (grape berry moth) or *Pseudopezicula tetraspora* (angular leaf scorch) is found, AQIS would inform APHIS of the suspension of importation of fruit from the relevant areas until causes of detections could be ascertained and appropriate remedial measures taken.

Any 'lot' found to be infested or infected with any other quarantine pest or disease including fruit flies, would be either re-exported, destroyed or treated. AQIS would have to inform APHIS of the details of such findings including documentation, and would request corrective action. If leaves, soil or stems were found appropriate action would have to be taken.

Item 9. Documentation errors

Any consignment with incomplete documentation or where certification does not conform to specifications or seals of the containers are damaged, would be refused entry with the options of re-export or destruction. APHIS would have to be notified immediately by AQIS.

Item 10. Review of protocol

The protocol would be reviewed at the end of the first year of export of table grape fruit from California to Australia.

11. OPTIONS WHICH SHOULD ACHIEVE AUSTRALIA'S APPROPRIATE LEVEL OF PROTECTION

Based on the findings of the PRA, AQIS's preliminary view is that phytosanitary measures incorporating mandatory fumigation with methyl bromide, cold storage and on-arrival inspection of fresh table grapes would achieve Australia's appropriate level of protection against the quarantine pests listed in Section 8.

Option A is the preferred AQIS option to mitigate risks of pests of quarantine concern that could be introduced into Australia. Under this option, pre-fumigation inspection would be required before pre-shipment fumigation in California is carried out. This option would be allowed throughout the full season of export of table grapes from California into Australia. In addition, general requirements under all options are considered by AQIS to be mandatory for mitigating risks from pests of quarantine concern associated with imports of table grapes.