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Eradication of Isolated Populations of Light Brown Apple Moth in California

**Environmental Assessment
June 2007**

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I. Introduction

A. Biology of Light Brown Apple Moth

The light brown apple moth (LBAM) (*Epiphyas postvittana*) is native to Australia where it is considered to be an economically important pest on many fruit crops. LBAM also attacks a wide variety of other plants including over 200 other agronomically important crops and other non-crop plant species that occur in 120 plant genera (appendix A). In addition to Australia, LBAM has also been found in New Zealand, New Caledonia, Hawaii, and the British Isles. The moth lays eggs in overlapping masses preferably on leaves but also on fruit and stems of the host plant. The larvae hatch and then pass through six stages where it will be approximately 18 mm before pupation. Young larvae are pale yellow while the mature larvae are pale green (Mo, 2006). Larvae will feed on leaves and fruit from susceptible host plants. Larvae in all stages will construct silken shelters at the feeding site, which is where pupation occurs. Adults are light brown with the females larger than the males, and females have a dark spot in the center of the front wings when folded. The number of LBAM generations produced in a growing season varies from one to over four, depending on environmental conditions (Danthanarayana, 1983; Mo et al., 2006). In cases where multiple generations occur in a season, the population can build to economically important thresholds quickly.

B. History of Infestation in California

In February 2007, LBAM was found near Berkeley in Alameda County, California. In response, pheromone-baited traps were placed in Alameda and Contra Costa Counties in March, 2007.

On March 16, 2007, the Agriculture Research Service Systematic Entomology Laboratory in Washington, DC, confirmed that the original finds were positive. On April 20, 2007, the California Department of Food and Agriculture (CDFA) issued a quarantine of at least 182-square miles in Alameda, Contra Costa, San Francisco, Marin, and Santa Clara Counties. This quarantine was expanded to include Monterey, Santa Cruz, and San Mateo Counties in June, 2007.

The United States Department of Agriculture, Animal and Plant Health Inspection Service (APHIS) issued a Federal quarantine order on May 2, 2007, requiring inspection and certification of all nursery stock and host commodities from Alameda, Contra Costa, Marin, Monterey, San Francisco, San Mateo, Santa Clara, and Santa Cruz Counties. The

Federal quarantine order mandates trapping at a rate of one trap per 5 acres and imposes additional conditions on the movement of host material to prevent the spread of LBAM.

Since March, 2007, approximately 30,000 traps have been placed throughout the State of California. The traps are baited bimonthly and serviced biweekly. There have been over 3,600 positive detections in nine counties with the majority of the detections (over 3,300) located within Santa Cruz and Monterey Counties.

C. Purpose and Need

APHIS is responsible for taking actions to exclude, eradicate, and/or control plant pests under the Plant Protection Act (7 United States Code (U.S.C.) 7701). Therefore, it is important that APHIS take the steps necessary to eradicate LBAM from areas in California to prevent its spread to susceptible host plants throughout the United States. APHIS, in cooperation with CDFA, is developing an eradication program for LBAM. The eradication program will be completed when the final recommendations of the LBAM Technical Working Group are received, evaluated, and incorporated into the program. Recommendations are expected in the near future to be followed closely by an eradication plan, at which time an environmental assessment (EA) will be completed on the plan. In the interim, treatment of small, isolated populations of LBAM is a desirable strategy to limit the spread of the moth until an eradication program can be implemented. This EA evaluates the potential impacts from eradication treatments of small isolated detections of LBAM. Currently, two isolated populations, Napa and Oakley, California, have been identified for eradication. These sites are considered in this EA. It is anticipated that additional sites may also be considered in the future.

This EA has been prepared consistent with the National Environmental Policy Act of 1969 (NEPA) and APHIS' NEPA implementing procedures (7 Code of Federal Regulations (CFR) part 372) for the purpose of evaluating how the proposed action, if implemented, may affect the quality of the human environment.

D. Affected Environment

Currently, proposed areas of treatment are restricted to an area in Oakley, California, and a second area in Napa, California (appendix B). The Napa treatment site is composed of a developed residential area that also has a small stream within the treatment boundary. The Oakley site consists of two relatively new subdivisions

and adjacent small ranches. The treatment areas consist of an area approximately 200 meters in radius around a positive trap site. In Napa, there is a single positive trap site; in Oakley, there are two trap sites in close proximity to each other. The treatment area in Oakley will include the 200-meter radius around the two traps, as well as the area between the traps. Other areas where isolated detections of LBAM have occurred may be treated in the future, where appropriate.

II. Alternatives

This EA analyzes the potential environmental consequences of the proposed action to eradicate isolated populations of LBAM from California where it has been detected. Two alternatives are being considered: (1) no action by APHIS to eliminate LBAM, and (2) treatment of isolated populations of LBAM. Treatment of LBAM would include one of three options: use of *Bacillus thuringiensis kurstaki* (Btk); use of a pheromone in traps or for mating disruption; or, a combination of Btk and a pheromone.

A. No Action

The no action alternative consists of maintaining the current Federal order without further action by APHIS. Private landowners would manage LBAM infestations, as appropriate.

Pursuant to the Federal order, the following regulated articles would not be moved interstate from a quarantine area except in accordance with this order:

- Nursery stock;
- Cut flowers, garlands, wreaths, or greenery of any plants;
- Trees and bushes, including cut Christmas trees;
- Greenwaste;
- Fruits and vegetables;
- Hay, straw, fodder, and plant litter;
- Bulk herbs and spices;
- Any other products, articles, or means of conveyance of any character whatsoever, when it is determined by an inspector that they present a hazard of spread of LBAM.

B. Treatment Alternative

The treatment alternative consists of maintaining the Federal quarantine order to prevent the artificial spread of LBAM, as well as using a chemical treatment to eradicate small, isolated (outlier)

populations of the moth from areas in California in which it has been found. Current treatment areas are a 200-meter radius around traps that have captured one or two moths and that are located outside of the immediate infested areas in southern Santa Cruz and northern Monterey Counties, and from a second area where LBAM catches have been concentrated. This is a contiguous area consisting of northwest Alameda, western Contra Costa, and northern San Francisco Counties. Treatments will consist of multiple applications of Btk (at least six) at approximately 10- to 14-day intervals using ground equipment to control larvae, and, when appropriate, pheromone applications to reduce reproduction by adult moths.

1. Btk

The biological insecticide, *Bacillus thuringiensis kurstaki* (Btk) will be applied in areas suspected of supporting LBAM. Btk is a naturally derived pesticide that has specific insecticidal activity against certain larval butterfly and moth species, including LBAM. Applications will occur by ground using the formulated product Dipel® Pro DF mixed in water at an application rate of 2 lb/acre. The formulation contains 54% of the active material. Dipel® Pro DF is the formulation that is labeled for use in organic production.

2. Pheromone

The LBAM-specific pheromone consists of two compounds that have been isolated and identified as (E)-11-tetradecen-1-yl acetate and (E,E)-9,11-tetradecadien-1-yl acetate. LBAM-specific pheromone trapping will be implemented where appropriate to trap adults in cases where Btk applications are not possible. The pheromone will also be employed when the mating disruption technique is implemented. During mating disruption, the pheromone can be applied by hand in a dispenser suspended from the ground or applied by ground application equipment either as a liquid or impregnated plastic chips. Mating disruption will be used in situations where overlapping generations are observed and there is a need to reduce reproduction. The pheromone may also be used in situations where Btk cannot be used because of concern for local populations of butterflies and moths. When used at efficacious levels, the pheromone reduces the ability of male LBAM to locate and mate with females.

III. Environmental Impacts

A. No Action

Under the no action alternative, the current Federal order would remain in place without application of Btk and/or the pheromone to eliminate small outlying areas where the moth has been detected. The use of insecticide applications would only occur by private individuals who need to control LBAM on crops. This would leave infested

non-agricultural areas with susceptible plant hosts without a coordinated treatment plan. Agricultural areas that had been previously treated for LBAM would be susceptible to reinfestation from adjacent untreated but infested sites. Reinfested sites would require additional pesticide applications thus increasing pesticide loading to the environment. Alternative pesticides may have higher use rates and increased risk to human health and the environment. In addition to environmental impacts, the economic costs to California agriculture could exceed \$133 million dollars in lost production and control costs based on the gross value of crops in 2005 for apples, pears, oranges, grapes, apricots, avocados, kiwifruit, strawberries, and peaches (CDFA, 2007). Potential costs could be higher if costs to nurseries and other host crops are included. The loss of revenue from international and domestic imports is currently unknown but could be significant if LBAM becomes established in California. In 2003, California shipped over \$7.2 billion in food and agricultural commodities around the world (CASS, 2004).

B. Treatment Alternative

1. Btk

Btk is a common bacteria found naturally in soil, foliage, wildlife, water, and air throughout the world. Several isolates of Btk exist that have selective insecticidal activity against different groups of invertebrates. Btk is an isolate with selective activity against certain butterflies and moths.

a. Toxicity

Based on mammalian toxicity studies testing the technical active ingredient and the formulated product, Btk has low acute oral, dermal, and inhalation toxicity and pathogenicity (EPA, 1998; USFS, 2004). These laboratory studies have also been supported by epidemiology studies that revealed no direct human health effects from Btk applications. Results from laboratory and epidemiology studies indicate that Btk is not a carcinogen, mutagen, or a reproductive toxicant (EPA, 1998; USFS, 2004). Btk is not considered a strong irritant; however, there are laboratory and field data that show that it is a mild eye and inhalation irritant.

Btk is considered to have low toxicity to birds based on acute oral and dietary toxicity values. Oral median lethal dose (LD₅₀) values were greater than 3333 mg/kg day and dietary median lethal concentration (LC₅₀) values were greater than 1.8 X 10¹⁰ spores/kg for the bobwhite quail and mallard duck (EPA, 1998). Chronic toxicity data for birds is not available based on the low acute toxicity of Btk. The lack of acute toxicity to birds is supported by several field studies where no direct

effects to birds were seen in forestry applications of Btk. However, some indirect effects were noted in studies where birds relied on caterpillar larvae as a primary food source. In some cases slight effects on reproduction, such as nestling growth rates, were noted (Norton et al., 2001); however, in other studies, no indirect effects on reproduction were noted (USFS, 2004). The studies that noted indirect effects had applications over large forested areas which will not occur in the proposed treatments for LBAM. Effects to nontarget terrestrial invertebrates are highly variable and dependent on the test organism. Even within the lepidopteran group that contains butterflies and moths, sensitivities can be highly variable (Peacock et al., 1998). In general, toxicity to pollinators and beneficial insects is considered low based on laboratory and field studies testing honey bees as well as other beneficial insects (USFS, 2004).

Btk has low acute aquatic vertebrate toxicity based on laboratory studies with multiple freshwater and saltwater fish species. In all cases, the calculated LC₅₀ value was above the highest test concentration used in the study (USFS, 2004). Sublethal toxicity to fish is also low with a reported no observable effect concentration (NOEC) of 1.4 mg/L for the most sensitive fish species. Btk has low toxicity to *D. magna* in 21-day studies with EC₅₀ values between 5 and 50 mg/L, while other aquatic invertebrate groups such as mayflies, stoneflies, copepods, and mysid shrimp appear to be tolerant of Btk when exposed to concentrations well above those expected in the environment (USFS, 2004). Results from laboratory studies are supported by field data that suggests minimal effects to aquatic invertebrates from Btk use (Richardson and Perrin, 1994; Kreutzweiser et al., 1992, 1994; USFS, 2004).

b. Exposure and Risk

Btk persistence in terrestrial environments is dependent upon light, moisture, and temperature. Increased exposure to light, higher temperature, and moisture decrease the viability of Btk. In a summary regarding the environmental fate of Btk, a majority of studies indicate that insecticidal activity of Btk to be approximately 1 week (USDA, 1995); however, other studies have shown that while spore viability can decrease rapidly, insecticidal activity can persist up to 3 months under certain environmental conditions. In water, Btk activity is photolytically sensitive and dependent on organic matter content and salinity (USDA, 1995). Spores have been detected in aquatic field studies for 13 days and up to 4 weeks after spraying.

Based on the method of application and environmental fate information for Btk, nontarget exposure is expected to be low. Low

toxicity and exposure will result in minimal risk to nontarget organisms. Label language prohibiting the application of Btk to surface water will further reduce the risk to aquatic nontarget organisms. At the Napa treatment site, aquatic exposure will be further reduced by avoiding treatment to the riparian corridor thus creating a buffer of at least 50 feet from Napa Creek. There are no water resources in the proposed Oakley treatment site. Although Btk can cause some mild inhalation and eye irritation, precautionary statements on the label and recommendations on personal protective equipment reduce the potential for exposure.

2. Pheromone

A selective pheromone has been developed to attract the male LBAM. The pheromone is specific to LBAM and has been isolated and identified as two compounds, (E)-11-tetradecen-I-yl acetate and (E,E)-9,11-tetradecadien-I-yl acetate. Both compounds have been identified in extracts of female LBAM and are active as a coalitive pair (Bellas et al., 1983). The pheromone can be applied in individual dispensers or, for larger areas, the use of ground equipment can be used to broadcast spray liquid pheromone or pheromone impregnated plastic chips. For the dispensers, the pheromone is contained within a sealed polyethylene tube containing 163.25 mg of (E)-11-tetradecen-I-yl acetate and 6.74 mg of (E,E)-9,11-tetradecadien-I-yl acetate. A wire is fused inside the plastic so that the dispenser can be twisted around a branch. The pheromone is released into the surrounding area and disrupts the ability of male LBAM to locate females. This method of control has been shown to be an effective means of LBAM control in citrus, grapes, and apple and apricot orchards when adequate numbers of dispensers are used (Mo et al., 2006). The pheromone can also be used as a lure to attract male LBAM to traps where they are caught and perish.

a. Toxicity

Based on available toxicity data for the pheromone, it has low acute oral and dermal toxicity in rats with LD₅₀ values of greater than 5,000 mg/kg and 2,000 mg/kg, respectively. Acute inhalation toxicity is also low based on the acute inhalation LC₅₀ value of greater than 5.25 g/L. The product is considered a slight to moderate dermal irritant and is not considered to be carcinogenic or mutagenic (Pacific Biocontrol Corporation, 2007).

Little nontarget data currently exists for LBAM pheromone; however, the toxicity is expected to be low to nontarget birds and mammals based on the specificity of the pheromone and the known toxicity to mammals. Toxicity to aquatic organisms is unknown for the LBAM pheromone; however, data for other pheromones derived from the

same family of moths suggests low toxicity to fish and aquatic invertebrates (PMRA, 1994).

b. Exposure and Risk

The persistence of the pheromone as a liquid formulation is currently unknown; however, based on field studies for the dispenser application, the pheromone is expected to be active for approximately 6 months. The pheromone is considered to be insoluble in water.

Exposure to human health and the environment is expected to be minimal. In the case of the dispenser application, the pheromone is inside a plastic tube that is suspended in a tree; therefore, no related exposure from residues or drinking water is expected. The same would also be true for terrestrial nontarget organisms where exposure would be expected to be minimal based on the method of application. Exposure to aquatic organisms would not be expected since the pheromone will be applied using dispensers and label language prohibits discarding dispensers in surface water. The pheromone that could end up in surface water as drift from liquid or plastic chip applications would be of low risk to aquatic organisms due to the low solubility of the LBAM pheromone and expected low toxicity to aquatic organisms based on available toxicity data for related pheromone products. In addition, label language for ground applications of the pheromone prohibit application to water which will further reduce exposure to aquatic organisms.

C. Cumulative Effects

In areas where Btk will be used, other Bt applications are likely to occur since the active ingredient is widely used in agricultural and nonagricultural areas. The proposed treatments cover a small isolated area and will provide negligible increased environmental loading of *Bacillus* spores. Label language prohibiting applications to surface water and the short half-life in water will reduce additional loading to aquatic environments. Cumulative effects to nontarget terrestrial organisms are expected to be minor due to the low risk of Btk and the small areas where applications will occur.

Cumulative effects from potential pheromone use are also expected to be negligible due to the specificity of the pheromone to LBAM and its minimal risk to human health and the environment. Cumulative impacts to nontarget butterflies and moths from the use of pheromones are also not anticipated because the pheromone is selective for LBAM.

If LBAM were to become established, a distinct possibility under the no action alternative, multiple applications of Btk and other insecticides applied in an uncoordinated fashion could result in reduced populations of Lepidopterans. In small, isolated populations of LBAM, even if other non-endangered/threatened Lepidopteran populations were reduced, they would quickly rebound due to recolonization of the small treatment areas by Lepidopterans in surrounding, untreated areas. This might not be the case, however, if LBAM were to become established in a widespread area.

D. Threatened and Endangered Species

Section 7(a)(2) of the Endangered Species Act (ESA) and its implementing regulations require all Federal agencies to insure their actions are not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of critical habitat. CDFA and APHIS are working with the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) to insure that treatment activities considered in this EA, the use of Btk and pheromones for the eradication of isolated populations of LBAM, do not affect listed species or their designated and proposed critical habitats.

APHIS and CDFA have been in early consultation with FWS and NMFS to identify any potential co-occurrence of listed species in the currently proposed treatment areas. Based on this early consultation, APHIS and CDFA generated and reviewed the list of species that may reside in the treatment areas wholly included in the Napa (500D) and Brentwood (463B) United States Geological Survey 7.5-minute quadrangle maps included as appendix C. This review of current species distributions and proximate locations to the treatment areas identified one listed species, Central California Coast steelhead (*Onchorhynchus mykiss*), that may co-occur in close proximity to the Napa treatment area. CDFA and NMFS conducted a site visit to that location on June 1, 2007, to assess potential for steelhead or their habitat to be exposed to Btk based on the proposed treatment. CDFA described their treatment plan to NMFS, who agreed that the treatment planned at the Napa site will not affect the listed steelhead. In addition, APHIS and CDFA have concluded that no listed species or critical habitat, under the jurisdiction of FWS, will be affected by these two specific treatment actions. This process of early consultation with FWS and NMFS will be repeated for each additional isolated LBAM population that is identified for treatment prior to the adoption of the overall LBAM eradication plan that is under development by APHIS and CDFA.

APHIS and CDFA will continue to work in close cooperation with FWS and NMFS to insure that potential impacts to listed species and their designated critical habitats are avoided or minimized, to the extent possible, and consistent with the statutory and regulatory requirements of section 7 to insure compliance with ESA throughout the development and implementation of the LBAM eradication program.

E. Other Considerations

EO 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations," focuses Federal attention on the environmental and human health conditions of minority and low-income communities and promotes community access to public information and public participation in matters relating to human health or the environment. This EO requires Federal agencies to conduct their programs, policies, and activities that substantially affect human health or the environment in a manner so as not to exclude persons and populations from participation in or benefiting from such programs. It also enforces existing statutes to prevent minority and low-income communities from being subjected to disproportionately high or adverse human health or environmental effects. APHIS has determined that the environmental and human health effects from the proposed applications for treatment of LBAM in California are minimal and are not expected to have disproportionate adverse effects to any minority or low-income populations.

EO 13045, "Protection of Children from Environmental Health Risks and Safety Risks," acknowledges that children, as compared to adults, may suffer disproportionately from environmental health and safety risks because of developmental stage, greater metabolic activity levels, and behavior patterns. This EO (to the extent permitted by law and consistent with the agency's mission) requires each Federal agency to identify, assess, and address environmental health risks and safety risks that may disproportionately affect children. Proposed treatments for LBAM in the Napa and Oakley sites will not occur near schools, parks, or day care centers where children may be present. Applications will be made using ground equipment which will minimize off-site movement of any material. If treatments are needed for other isolated LBAM populations, care will be taken to minimize any potential for exposure of children to LBAM treatments. A low potential for exposure and low toxicity of either product minimizes any potential risk to children.

IV. Listing of Agencies and Persons Consulted

U.S. Fish and Wildlife Service
California & Nevada Operations Office
2800 Cottage Way
Sacramento, CA 95821

U.S. Fish and Wildlife Service
Sacramento Fish & Wildlife Office
2800 Cottage Way
Sacramento, CA 95821

National Marine Fisheries Service
Santa Rosa Office
Southwest Region
777 Sonoma Ave, Ste 325
Santa Rosa, CA 95404

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Emergency and Domestic Programs, PPQ
4700 River Rd. Unit 134
Riverdale, MD 20737

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
PPD, Environmental Services
4700 River Road, Unit 149
Riverdale, MD 20737

California Department of Food and Agriculture
Plant Health and Pest Prevention Services
1220 N Street
Sacramento, CA 95814

V. References

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Appendix A. Light Brown Apple Moth Host List

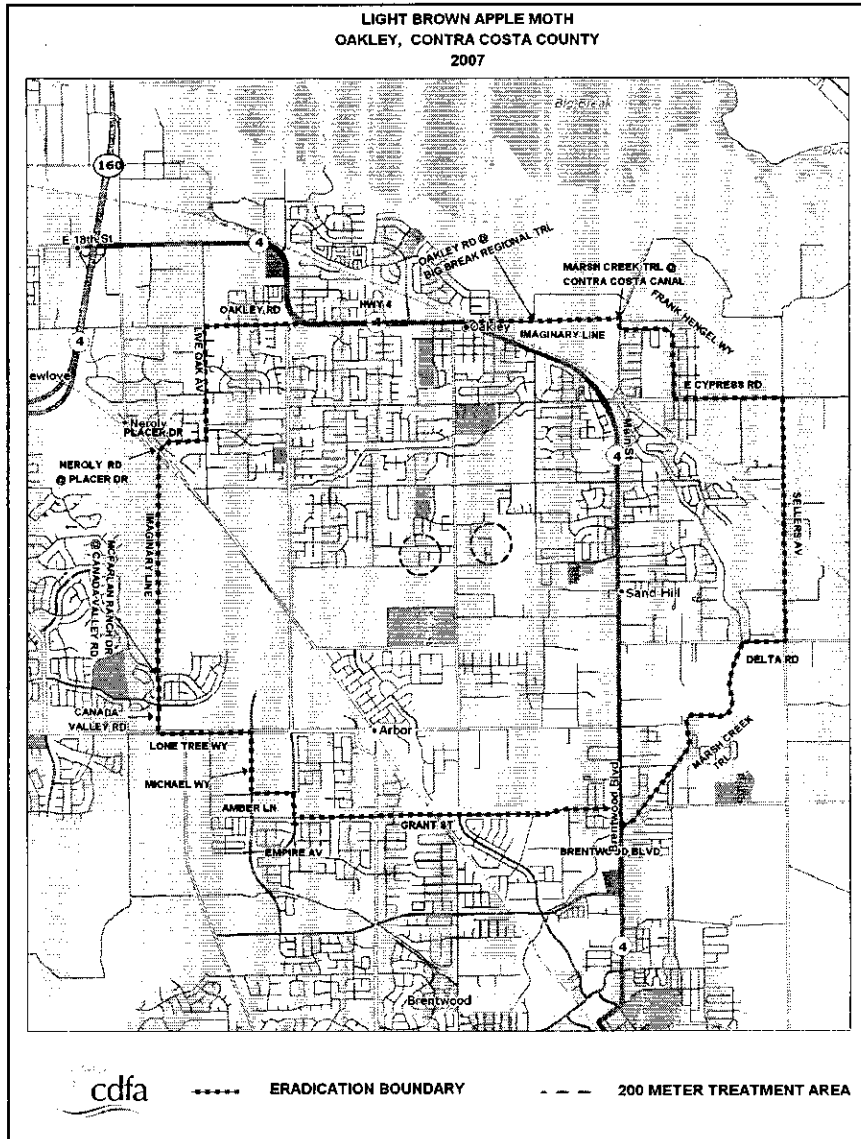
Abies grandis (grand fir)
Acacia spp. (acacias)
Achillea millefolium (common yarrow)
Actinidia chinensis (Chinese gooseberry)
Actinidia deliciosa (kiwifruit)
Adiantum spp. (maidenhair ferns)
Alnus glutinosa (black alder/European alder)
Amaranthus spp. (amaranths)
Apium graveolens (celery)
Aquilegia spp. (columbines)
Arbutus spp. (madrone, strawberry tree)
Arctotheca spp. (capeweeds, cape dandelion)
Arctotis stoechadifolia (African daisy)
Artemesia spp. (mugwort, sage brush, tarragon, worm wood, etc.)
Astartea spp.
Aster spp. (asters)
Baccharis spp. (coyote brush, desert broom)
Boronia spp. (boronias)
Brassica spp. (broccoli, cabbage, cress, mustard, radish, turnip, etc.)
Breynia spp. (snow bush)
Buddleia spp. (butterfly bush)
Bursaria spp. (black thorns)
Calendula spp. (calendula)
Callistemon spp. (bottle brush)
Camellia japonica (camellia)
Campsis spp. (trumpet creeper, trumpet vine)
Capsicum frutescens (chile pepper)
Cardus nutans (musk thistle)
Cassia spp. (golden shower, pink shower, rainbow shower, gold medallion tree)
Ceanothus spp. (buck brush, wild lilac)
Cedrus spp. (cedar)
Centranthus spp. (fox's brush/heliotrope/valerian)
Chamaecyparis lawsoniana (Lawson's cypress)
Chenopodium album (fat-hen)
Chimonanthus sp. (wintersweet)
Choisya spp. (Mexican orange)
Chrysanthemum spp. (chrysanthemums)
Chrysanthemum x morifolium (mums)
Cirsium arvense (Canada thistle)
Cirsium vulgare (bull thistle)
Citrus spp. (citrus)
Clematis spp. (clematis, virgin's bower, lather flower, vase vine)
Clerodendron spp. (bleeding heart vine, bowers, tubeflower, Turk's turban)
Conyza bilbaoana (a fleabane)
Cordyline australis (cabbage tree)
Correa spp. ((Australian fuchsia)
Cotoneaster spp. (cotoneaster)
Crataegus spp. (hawthorn)

Crocoshmia spp. (montbretia)
Cryptomeria japonica (Sugi)
Cucumis sativus (cucumber)
Cucurbita spp. (pumpkin)
Cupressus sp. ((cypress)
Cydonia spp. (quince)
Cyphomandra betacea (tree tomato)
Cytisus scoparius (Scotch broom)
Dahlia spp. (dahlia)
Datura spp. (angel's trumpet, Jimson weed, thorn apple)
Daucus spp. (carrot, Queen Anne's lace)
Dodonaea spp. ((hop bush, hopseed bush)
Diospyros spp. (persimmon)
Erica lustranica (Spanish heath)
Eriobotrya spp. (loquat)
Eriostemon spp. (wax flower)
Escallonia spp. (escallonias)
Eucalyptus spp. (eucalyptus, gum trees)
Euonymus spp. (euonymus)
Feijoa sellowiana (feijoa, pineapple guava)
Forsythia spp. (forsythias)
Fortunella spp. (kumquats)
Fragaria spp. (strawberry)
Fraxinus velutina (velvet ash)
Gelsemium spp. (Carolina jessamine)
Genista spp. (brooms)
Gerbera spp. (Transvaal daisy)
Gypsophila paniculata (baby's breath)
Grevillea spp. (hummingbird bush, grevilleas)
Hardenbergia spp. (lilac vine)
Hebe spp. (hebe)
Hedera spp. (ivy)
Helianthus tuberosus (Jerusalem artichoke)
Helichrysum spp. (curry plant, licorice plant, straw flower)
Humulus lupulus (hops)
Hypericum androsaemum (sweet-amber)
Hypericum calycinum (Aaron's beard)
Hypericum humifusum (trailing St. John's wort)
Hypericum perforatum (St John's wort)
Ilex sp. (holly)
Jasminum spp. (jasmine)
Juglans spp. (California black walnut, butternut)
Kunzea ericoides (white tea tree)
Lagunaria patersonii (Norfolk Island hibiscus)
Lathyrus spp. (sweet pea)
Lavendula spp. (lavenders)
Leptospermum spp. (tea trees)
Leucodendron spp. (silver tree)
Ligustrum spp. (privet)
Linum spp. (flax)
Litchi chinensis (litchi)

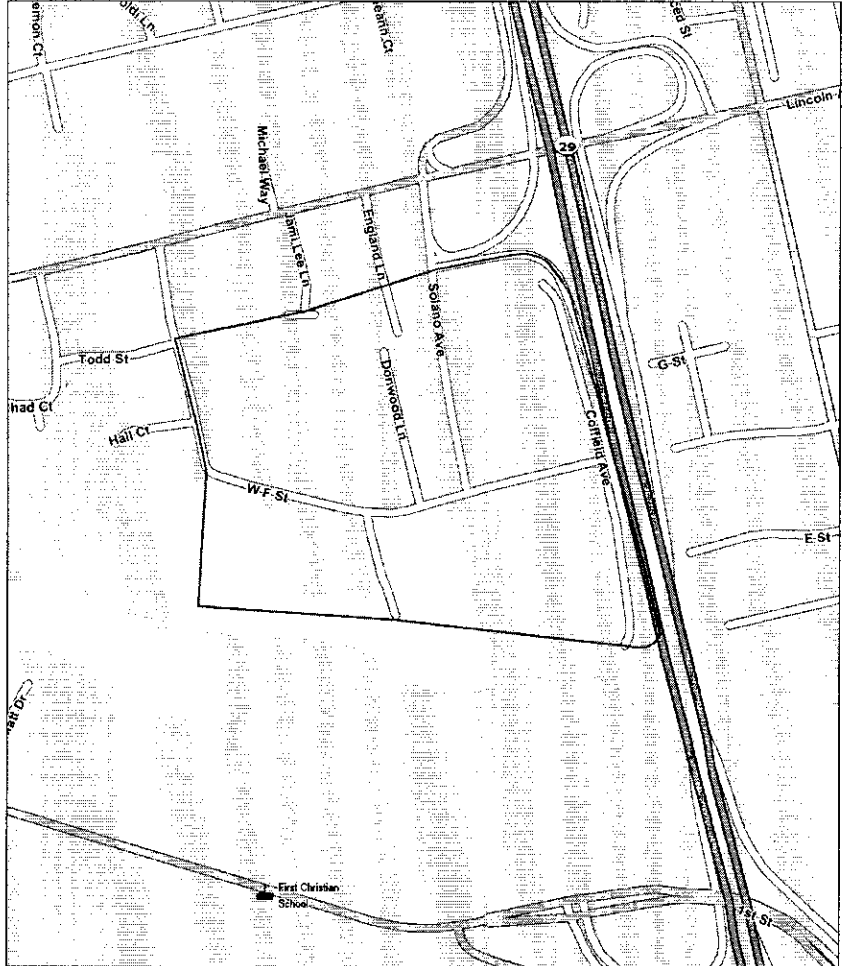
Lonicera spp. (honeysuckles)
Lupinus spp. (lupines)
Lycopersicum spp. (tomatoes)
Macadamia spp. (macadamia)
Malus spp. (apple)
Mangifera spp. (mango)
Medicago sativa (alfalfa)
Melaleuca spp. (honey myrtle, bottlebrush)
Mentha spp. (mint)
Mesembryanthemum spp. (ice plant)
Metrosideros excelsa (New Zealand Christmas tree)
Michelia spp. (michelia)
Monotoca spp. (broomheaths)
Myoporum spp. (myoporum)
Olea europaea (olive)
Oxalis spp. (lady's sorrel, redwood sorrel, wood sorrel)
Parkinsonia aculeata (Mexican Palo Verde)
Parthenocissus spp. (woodbine, Virginia creeper)
Passiflora edulis (passionfruit)
Passiflora mollissima (banana passionflower or passionfruit or poka)
Pelargonium spp. (florist's geraniums)
Persea americana (avocado)
Persoonia spp.
Petroselinum spp. (parsley)
Phaseolus vulgaris (common bean)
Philadelphus spp. (mock orange)
Phormium tenax (New Zealand flax)
Photinia spp. (photinia)
Picea spp. (spruce)
Pieris japonica (Japanese pieris or andromeda)
Pinus spp. (pines)
Pisum sativum (pea)
Pittosporum spp. (pittosporums)
Plantago lanceolata (narrowleaf plantain)
Plantago major (common plantain)
Platysace spp. (native parsnip)
Polygala spp. (milkworts)
Polygonum spp. (fleece flower, knotweed, smartweed)
Populus spp. (cottonwood, poplar)
Prunus amygdalus (almond)
Prunus armeniaca (apricot)
Prunus avium (sweet cherry)
Prunus domestica (plum)
Prunus persica (peach)
Prunus persica var *nectarina* (nectarine)
Pseudopanax sp. (lancewood)
Pseudotsuga japonica (Japanese Douglas-fir)
Pseudotsuga menziesii (Douglas-fir)
Pteris spp. (brake, dish fern, table fern)
Pulcaria spp.
Pyllanthus spp.

Pyracantha spp. (fire thorn)
Pyrus spp. (pear)
Quercus spp. (oak)
Ranunculus spp. (buttercups, crowfoot)
Raphanus spp. (wild radish)
Reseda spp. (mignonette)
Rhododendron spp. (rhododendron)
Ribes spp. (currant)
Robinia pseudoacacia (black locust)
Rosa spp. (roses)
Rubus spp. (blackberry, boysenberry, raspberry)
Rumex acetosa (garden sorrel, spinach dock)
Rumex acetosella (common sheep sorrel)
Rumex pulcher (fiddle dock)
Rumex crispus (curled dock)
Rumex obtusifolius (broadleaf dock)
Salix spp. (willow)
Salvia spp. (sages)
Senecio spp. (dusty-miller, groundsels)
Sequoia sp. (redwood)
Sida spp. (Virginia mallow)
Sisymbrium spp.
Smilax spp. (greenbrier, Jacob's ladder, wild sarsaparilla)
Solanum tuberosum (potato)
Solidago canadensis (Canada goldenrod)
Sollya spp. (Australian bluebells, bluebell creeper)
Sonchus asper (spiny sowthistle)
Sonchus kirkii (shore sowthistle)
Sonchus oleraceus (common sowthistle)
Thuja plicata (Western red cedar)
Tithonia spp. (Mexican sunflower)
Trema spp.
Trifolium spp. (clover)
Triglochin spp. (arrow grass)
Ulex europaeus (gorse)
Urtica spp. (nettles)
Vaccinium sp. (blueberry)
Viburnum spp. (arrowwoods)
Vicia faba (broad bean)
Vinca spp. (periwinkles)
Vitis spp. (grape)
Weinmannia racemosa (kamahi)
Zea mays (corn)
Zelkova serrata (Japanese zelkova)

Appendix B. Treatment locations for Oakley and Napa California



LIGHT BROWN APPLE MOTH
NAPA, NAPA COUNTY
200M GROUND TREATMENT



— 200M BOUNDARY

Appendix C. Species List for Eradication of Isolated Populations of Light Brown Apple Moth in California

Appendix C – Species List



United States Department of the Interior FISH AND WILDLIFE SERVICE

**Sacramento Fish and Wildlife Office
2800 Cottage Way, Room W-2605
Sacramento, California 95825**



June 8, 2007

Document Number: 070608125232

Maria Boroja
APHIS PPD Environmental Services
4700 River Road
Unit 149
Riverdale, MD 20737

Subject: Species List for Eradication of Isolated Populations of Light Brown Apple Moth
in California

Dear: Ms. Boroja

We are sending this official species list in response to your June 8, 2007 request for information about endangered and threatened species. The list covers the California counties and/or U.S. Geological Survey 7½ minute quad or quads you requested.

Our database was developed primarily to assist Federal agencies that are consulting with us. Therefore, our lists include all of the sensitive species that have been found in a certain area *and also ones that may be affected by projects in the area*. For example, a fish may be on the list for a quad if it lives somewhere downstream from that quad. Birds are included even if they only migrate through an area. In other words, we include all of the species we want people to consider when they do something that affects the environment.

Please read Important Information About Your Species List (below). It explains how we made the list and describes your responsibilities under the Endangered Species Act.

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be September 06, 2007.

Please contact us if your project may affect endangered or threatened species or if you have any questions about the attached list or your responsibilities under the Endangered Species Act. A list of Endangered Species Program contacts can be found at www.fws.gov/sacramento/es/branches.htm.

Endangered Species Division



**Federal Endangered and Threatened Species that Occur in
or may be Affected by Projects in the Counties and/or
U.S.G.S. 7 1/2 Minute Quads you requested**

Document Number: 070608125232

Database Last Updated: March 5, 2007

Quad Lists

Listed Species

Invertebrates

- Branchinecta conservatio
 - Conservancy fairy shrimp (E)
- Branchinecta longiantenna
 - longhorn fairy shrimp (E)
- Branchinecta lynchi
 - Critical habitat, vernal pool fairy shrimp (X)
 - vernal pool fairy shrimp (T)
- Desmocerus californicus dimorphus
 - valley elderberry longhorn beetle (T)
- Lepidurus packardi
 - vernal pool tadpole shrimp (E)
- Syncaris pacifica
 - California freshwater shrimp (E)

Fish

- Hypomesus transpacificus
 - Critical habitat, delta smelt (X)
 - delta smelt (T)
- Oncorhynchus mykiss
 - Central California Coastal steelhead (T) (NMFS)
 - Central Valley steelhead (T) (NMFS)
 - Critical habitat, Central California coastal steelhead (X) (NMFS)

- *Oncorhynchus tshawytscha*
 - Central Valley spring-run chinook salmon (T) (NMFS)
 - winter-run chinook salmon, Sacramento River (E) (NMFS)

Amphibians

- *Ambystoma californiense*
 - California tiger salamander, central population (T)
- *Rana aurora draytonii*
 - California red-legged frog (T)

Reptiles

- *Masticophis lateralis euryxanthus*
 - Alameda whipsnake [=striped racer] (T)
- *Thamnophis gigas*
 - giant garter snake (T)

Birds

- *Haliaeetus leucocephalus*
 - bald eagle (T)
- *Sternula antillarum* (=Sterna, =albifrons) browni
 - California least tern (E)
- *Strix occidentalis caurina*
 - northern spotted owl (T)

Mammals

- *Reithrodontomys raviventris*
 - salt marsh harvest mouse (E)
- *Vulpes macrotis mutica*
 - San Joaquin kit fox (E)

Plants

- *Lasthenia conjugens*
 - Contra Costa goldfields (E)
 - Critical habitat, Contra Costa goldfields (X)

Candidate Species

Fish

- *Oncorhynchus tshawytscha*
 - Central Valley fall/late fall-run chinook salmon (C) (NMFS)
 - Critical habitat, Central Valley fall/late fall-run chinook (C) (NMFS)

Quads Containing Listed, Proposed or Candidate Species:

BRENTWOOD (463B)

NAPA (500D)

County Lists

No county species lists requested.

Key:

- (E) Endangered - Listed as being in danger of extinction.
- (T) Threatened - Listed as likely to become endangered within the foreseeable future.
- (P) Proposed - Officially proposed in the Federal Register for listing as endangered or threatened.
- (NMFS) Species under the Jurisdiction of the National Oceanic & Atmospheric Administration Fisheries Service. Consult with them directly about these species.
- Critical Habitat - Area essential to the conservation of a species.
- (PX) Proposed Critical Habitat - The species is already listed. Critical habitat is being proposed for it.
- (C) Candidate - Candidate to become a proposed species.
- (V) Vacated by a court order. Not currently in effect. Being reviewed by the Service.
- (X) Critical Habitat designated for this species

Important Information About Your Species List

How We Make Species Lists

We store information about endangered and threatened species lists by U.S. Geological Survey 7½ minute quads. The United States is divided into these quads, which are about the size of San Francisco.

The animals on your species list are ones that occur within, or may be affected by projects within, the quads covered by the list.

- Fish and other aquatic species appear on your list if they are in the same watershed as your quad or if water use in your quad might affect them.
- Amphibians will be on the list for a quad or county if pesticides applied in that area may be carried to their habitat by air currents.
- Birds are shown regardless of whether they are resident or migratory. Relevant birds on the county list should be considered regardless of whether they appear on a quad list.

Plants

Any plants on your list are ones that have actually been observed in the area covered by the list. Plants may exist in an area without ever having been detected there. You can find out what's in the surrounding quads through the California Native Plant Society's online [Inventory of Rare and Endangered Plants](#).

Surveying

Some of the species on your list may not be affected by your project. A trained biologist or botanist, familiar with the habitat requirements of the species on your list, should determine whether they or habitats suitable for them may be affected by your project. We recommend that your surveys include any proposed and candidate species on your list.

For plant surveys, we recommend using the [Guidelines for Conducting and Reporting Botanical Inventories](#). The results of your surveys should be published in any environmental documents prepared for your project.

Your Responsibilities Under the Endangered Species Act

All animals identified as listed above are fully protected under the Endangered Species Act of 1973, as amended. Section 9 of the Act and its implementing regulations prohibit the take of a federally listed wildlife species. Take is defined by the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect" any such animal.

Take may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or shelter (50 CFR §17.3).

Take incidental to an otherwise lawful activity may be authorized by one of two procedures:

- If a Federal agency is involved with the permitting, funding, or carrying out of a project that may result in take, then that agency must engage in a formal consultation with the Service.
- During formal consultation, the Federal agency, the applicant and the Service work together to avoid or minimize the impact on listed species and their habitat. Such consultation would result in a biological opinion by the Service addressing the anticipated effect of the project on listed and proposed species. The opinion may authorize a limited level of incidental take.
- If no Federal agency is involved with the project, and federally listed species may be taken as part of the project, then you, the applicant, should apply for an incidental take permit. The Service may issue such a permit if you submit a satisfactory conservation plan for the species that would be affected by your project.
- Should your survey determine that federally listed or proposed species occur in the area and are likely to be affected by the project, we recommend that you work with this office and the California Department of Fish and Game to develop a plan that minimizes the project's direct and indirect impacts to listed species and compensates for project-related loss of habitat. You should include the plan in any environmental documents you file.

Critical Habitat

When a species is listed as endangered or threatened, areas of habitat considered essential to its conservation may be designated as critical habitat. These areas may require special management considerations or protection. They provide needed space for growth and normal behavior; food, water, air, light, other nutritional or physiological requirements; cover or shelter; and sites for breeding, reproduction, rearing of offspring, germination or seed dispersal.

Although critical habitat may be designated on private or State lands, activities on these lands are not restricted unless there is Federal involvement in the activities or direct harm to listed wildlife.

If any species has proposed or designated critical habitat within a quad, there will be a separate line for this on the species list. Boundary descriptions of the critical habitat may be found in the Federal Register. The information is also reprinted in the Code of Federal Regulations (50 CFR 17.95). See our critical habitat page for maps.

Candidate Species

We recommend that you address impacts to candidate species. We put plants and animals on our candidate list when we have enough scientific information to eventually propose them for listing as threatened or endangered. By considering these species early in your planning process you may be able to avoid the problems that could develop if one of these candidates was listed before the end of your project.

Species of Concern

The Sacramento Fish & Wildlife Office no longer maintains a list of species of concern. However, various other agencies and organizations maintain lists of at-risk species. These lists provide essential information for land management planning and conservation efforts. [More info](#)

Wetlands

If your project will impact wetlands, riparian habitat, or other jurisdictional waters as defined by section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act, you will need to obtain a permit from the U.S. Army Corps of Engineers. Impacts to wetland habitats require site specific mitigation and monitoring. For questions regarding wetlands, please contact Mark Littlefield of this office at (916) 414-6580.

Updates

Our database is constantly updated as species are proposed, listed and delisted. If you address proposed and candidate species in your planning, this should not be a problem. However, we recommend that you get an updated list every 90 days. That would be September 06, 2007.

**Finding of No Significant Impact for
Eradication of Isolated Populations of
Light Brown Apple Moth in California
June, 2007**

The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), has prepared an environmental assessment (EA) that analyzes potential environmental consequences of eradicating isolated populations of light brown apple moth (*Epiphyas postvittana*) (LBAM) in California. The EA, incorporated by reference in this document, is available from:

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
Emergency and Domestic Programs
Emergency Management
4700 River Road, Unit 134
Riverdale, MD 20737-1236

The EA analyzed alternatives consisting of (1) maintaining the Federal quarantine order to prevent the artificial spread of LBAM by prohibiting movement of host materials outside the quarantine zone except under certain conditions (no action alternative), and (2) continuation of the Federal quarantine order along with eradication of isolated populations of LBAM in California with the use of *Bacillus thuringiensis kurstaki* (Btk) and/or LBAM-specific pheromone (treatment alternative).

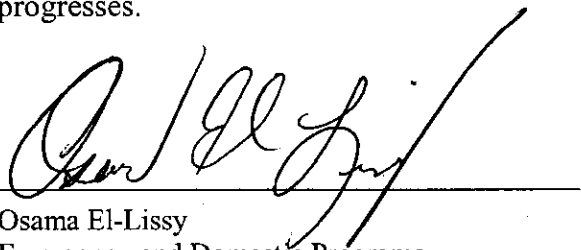
The EA evaluated the potential environmental effects of the various treatments on human health and nontarget organisms. The site specific application practices and the use of treatment options proposed in this EA have low toxicity and exposure and result in minimal risk to human health and the environment.

APHIS and the California Department of Food and Agriculture (CDFA) have consulted with the U.S. Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS), as required by the Endangered Species Act, for treatments of Btk in the Napa and Oakley, California, treatment sites. No listed species are found in the Oakley treatment site. A listed steelhead is found in Napa Creek which runs through the Napa treatment site. NMFS agreed with the APHIS and CDFA determination that the proposed treatment would have no effect on the listed steelhead. If additional sites are identified for treatment, APHIS and CDFA will consult with FWS and NMFS before proceeding with future treatments.

There are no disproportionate adverse effects to minorities, low-income populations, or children in accordance with Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations," and Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks."

APHIS' finding of no significant impact for this program is based upon the expected limited environmental consequences, as analyzed in the EA. An environmental impact statement (EIS) must be prepared if implementation of the proposed action may significantly affect the quality of the human environment. I have determined that there would be no significant impact to the human environment from the implementation of the treatment alternative and, therefore, no EIS needs to be prepared.

Response to the current LBAM infestation is urgent, therefore, program operations may begin immediately. However, any comments received during the announced comment period (which closes on July 13, 2007) will be considered and may result in changes to the program as it progresses.



Osama El-Lissy
Emergency and Domestic Programs
Plant Protection and Quarantine
Animal and Plant Health Inspection Agency

June 12, 2007

Date