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Light Brown Apple Moth (LBAM)

Implications for California Agriculture

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LBAM: Implications for California Agriculture

Introduction

There has been a significant amount of misinformation regarding the impact of LBAM on California agriculture. Regarding LBAM there are two primary agricultural concerns: 1. The potential loss of revenues due to crop damage should LBAM go unchecked. 2. The loss of agricultural revenues due to domestic and international quarantine restrictions against LBAM. CDFA has also alleged potential severe damage to native flora (cypresses, pines, redwoods) in their justification for the LBAM eradication program. Based on a comprehensive review of the available published data no significant damage to crops, except in very rare instances is to be expected, trade partners have expressed a willingness to change their quarantine policies and exercise trade flexibility if the US does the same, and there is no evidence anywhere in the world where LBAM is endemic or naturalized that LBAM will cause any damage to native trees. LBAM is a minor pest that is most often not present in crop systems due to natural predatory factors, when present LBAM is easily managed in crop systems using treatments that are currently being used for other pests (e.g. orange tortrix and omnivorous leafroller), and there are safe, effective, and cost-effective integrated pest management phytosanitary practices that can be used to meet national and international trade requirements.

Methodology

The information presented in this document was developed from a review of the primary scientific literature regarding the biology of LBAM, agricultural journals from Australia and New Zealand, field excursions to New Zealand growing regions, interviews with experts in horticulture, pheromones, biological controls, integrated pest management, communications with agricultural officials worldwide, specific LBAM experts, and a critical review of the CDFA's and USDA's published documents.

History of Classification of LBAM As an Objectionable Pest

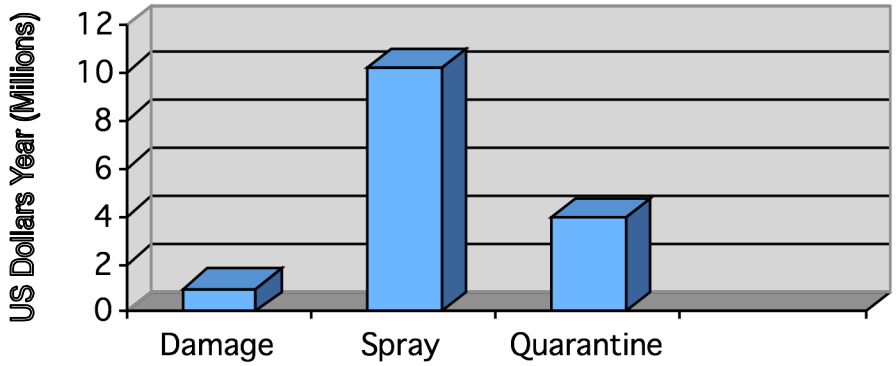
According to USDA, LBAM was first targeted as a pest of economic concern in 1957. This original review was supported by another USDA report of 1984. USDA commissioned a mini-risk assessment in 2003, and issued two other internal reports regarding LBAM in 2007. No formal pest risk assessment of LBAM according to internationally accepted guidelines has been performed. The classification of LBAM as an actionable pest is not supported by the totality of LBAM literature. The reviews used by USDA/CDFA in making their determination only used a very small portion of the available literature and do not accurately represent the risk presented by LBAM to either crops or native flora.

Trade Implications of LBAM As an Objectionable Pest

Classifying LBAM and other non-native pests as objectionable likely awarded the US a trade advantage in citrus and apples at a time when Australia and New Zealand were developing as apple and citrus producers. To maintain access to US markets, both Australia and New Zealand have to meet US LBAM restrictions. Today, neither Australia nor New Zealand has difficulties meeting the US zero-tolerance against LBAM through the use of integrated pest management practices. According to the USDA, the highest percentage of costs associated with LBAM in Australia is due to those incurred to meet US restrictions, not from crop damage. This is illustrated in Figure 1. The costs associated with the spray are to maintain LBAM populations to a non-detectable level, not because of the potential for crop damage but to meet US zero-tolerance requirements. Additionally, in New Zealand, LBAM is not singled out but is rather collectively grouped with other leafrollers into a leafroller complex, with

leafroller-associated costs similarly attributed to the need to meet US standards. Thus, costs associated with damage of crops is an accumulation of costs due to the leafroller complex not of LBAM alone. LBAM was introduced into Hawaii in 1896, and according to the Hawaii Department of Agriculture, LBAM has not been a pest of significance anywhere there and does not appear to be transported out of Hawaii on exported crops (Hawaii Department of Agriculture 2007).

Figure 1 Grower Costs for Management of LBAM in Australia



Source: United States Department of Agriculture, Oct 16, 2007

New Zealand Agriculture experts also report very little crop damage due to LBAM and very little need to treat for LBAM, except to meet US requirements. Rather, in most cases, control measures used for management of other pests (e.g. wooly apple aphid, mealy bugs, scale, thrips, mites, and especially codling moth) provides almost complete control over LBAM making the necessity to treat LBAM specifically very rare. By exempting various crops from quarantines, CDFA has acknowledged that treatment of other pests that will also affect LBAM is a legitimate control measure for LBAM.

Similarly, LBAM restrictions in both Canada and Mexico are harmonized with the US in order to meet the zero-tolerance required to maintain access to US markets, not necessarily because either country believes LBAM represents a significant danger to crops. Because LBAM was identified in the US, this invoked the US quarantine restrictions. Thus, the original US-initiated quarantine policies against LBAM that may have originally protected US agricultural interests have now been invoked against US agricultural interests leading to this current "emergency". However, Mexico agriculture officials have publicly stated a willingness to change their quarantine policies should the US policies regarding LBAM change (see Figure 2 below). Additionally, two California courts (Monterey and Santa Cruz) ruled that CDFA did not provide any evidence that an emergency regarding LBAM exists.

The transient nature of LBAM as a pest and its ability to be effectively mitigated through production-level management practices was supported in statements by USDA/APHIS officials to international trade partners (Dunkle 2007; Fedchock 2007). This should be given sincere consideration and not just political posturing for maintaining trade advantages.

> "Based on scientific consideration, *Epiphyas postvittana* is a Tortricid moth, and is a leaf tier that sometimes feeds externally on fruits. It is a transient pest, and through our standard phytosanitary export procedures, *E. postvittana* will not pose a threat to any of our importing countries."
>
> **Craig Fedchock, Assistant Deputy Administrator Phytosanitary Issues Management**

Biology of LBAM: Not a Pest of Economic Significance

LBAM is classified as a superficial leafroller. LBAM does not survive freezes, does not reproduce well at temperatures below 45 ˚F, and cannot thrive above 87 ˚F (USDA 2008; Venette et al. 2003) making it highly unlikely to occupy or thrive in much of California or US growing regions. This is evident in

Hawaii where LBAM populations are limited to higher cool and moist elevations. Like many other leafrollers, the agricultural damage associated with this class of pests is minimal and largely cosmetic. Experience has shown these insects predominantly cause superficial nibbling, occasionally blemished fruits, and rarely any damage of economic significance. California has more than 300 known LBAM-related tortricids, most of which do not cause any demonstrable damage to agricultural crops or native flora and most of which are controlled either by natural predators, of which there are many, or by general control methods for other pests, as noted previously. Agriculture experience in Australia, Hawaii, and New Zealand support these findings. In New Zealand, in the absence of organophosphates, beneficial predators provide a high degree of control of the leafroller complex and, in New Zealand, occasional use of insect growth regulators (e.g. Intrepid, Confirm: methoxyfenozide, tebufenozide) may be employed if monitoring data warrants it. Monitoring for LBAM is predominantly done to meet US zero-tolerance requirements and when necessary (also in order to meet US trade requirements) a single treatment of insect growth regulators applied when the larvae are feeding provides adequate control for the season. In the range of pests of potential economic significance, the leafroller complex is a relatively low priority and is rarely a problem, with 99% of economic damage to crops due to other pests. IPM practices utilized in New Zealand agriculture are highly effective at controlling all leafrollers to meet the zero-tolerance requirements of the US (MAF 2005). The same IPM practices that are utilized to control the leafroller complex in New Zealand are the same as those recommended by the University of California for control of the orange tortrix and omnivorous leaf roller (UC IPM 2006).

From a biological perspective, LBAM is a generalist and does not bloom out to infest any single crop. As a generalist, all stages of the life cycle of LBAM are parasitized by general predatory factors that include ants, bacteria, bats, beetles, birds, earwigs, spiders, minute stingerless wasps, and viruses. California and all parts of the US are replete with these general predators and California specifically has native wasps that alone offer a high degree of parasitization, as demonstrated in pilot studies by USDA and by researchers in the University of California system. Primary LBAM literature suggest rates of parasitization as high as 99% with a survival rate of only 1% from egg to pupae (Geier and Briese 1980). Other LBAM literature shows that tortricids, in general, show a level of egg parasitism of up to 30%; larval parasitism up to 60%; and pupal parasitism to 70% (Van Der Geest and Evenhuis 1991). These findings may be significantly compelling and suggestive of even higher levels of parasitism since these findings were at a time when organophosphates were widely used, which would have had a significantly detrimental effect on LBAM predators. It has been demonstrated that the discontinuation of organophosphates results in greater degrees of LBAM parasitism due to increases in beneficial predators (Geier and Briese 1980).

As noted, the most practical consideration for those in agriculture is the fact that pesticide treatments that are applied for the management and control of other pests (e.g. orange tortrix, omnivorous leafroller, wooly apple aphid, mealy bugs, scale, thrips, mites, and especially codling moth) also provide control over the leafroller complex making treatment of LBAM specifically a practice of the past, except in rare instances. Additional integrated pest management practices such as regular mowing in the summer, removal of green waste that can harbor eggs in understories during the winter, intercropping, and leaving flowering weeds (borage, clover, coriander, coyote bush) to draw beneficials have all been shown to provide natural controls against leafrollers in general and LBAM specifically (Begum 2004; Begum et al. 2006; Irvin et al. 2000; Thomas and Burnip 1993; UC IPM 2006).

Rethinking "Eradication"

With today's global trade and travel it is not practical for the US to implement eradication programs for every non-native species that enters the US. The basic biology of the pest and its realistic impact on agriculture and the environment should be determined PRIOR to the implementation of any action. This is especially true when a central part of the treatment program includes long-term spraying of residential areas and the use of organophosphates and other pesticides (e.g. chlorpyrifos, Bt, permethrin, spinosad) in residential communities that are otherwise only approved for limited and highly controlled use in agricultural areas. The applications of these in the broader ecosystem can lead to disruption of the ratio of pests to beneficial predators, in favor of the pests, therefore making it more

difficult to control pests long-term. All indications suggest that LBAM is a pest that should have been subject to appropriate monitoring prior to moving into eradication.

There is a need to rethink overall pest management policies with a focus on control versus eradication. Eradication implies an emergency program is needed and invokes numerous national and international quarantines that puts a tremendous burden on the farming community, or in this case, exposes residential communities, children, schools, community parks and playgrounds to pesticides usually reserved for specific agricultural use. Under current policies, a declared “emergency” means the government carries the financial burden of managing the emergency program, whereas with “controls”, the financial burden is carried by industry. This is another policy that requires consideration as there are times when Government funds would be best spent on control rather than eradication programs. This is likely the case with LBAM. As noted, all indications from agriculture data and experts in Australia, Hawaii, and New Zealand suggest LBAM is not a pest of significant economic impact with regards to actual crop damage. However, it appears that US policies demand an aggressive action before negotiating with trading partners to change restrictions. In light of LBAM experiences in other countries where LBAM is naturalized, the most legitimately necessary action would be effective monitoring of potential movement of LBAM from its current locale into agricultural areas and then monitoring to determine if it in fact represents a pest requiring treatment. In New Zealand in 2006, exporters shipped approximately 3000 containers of produce to the US. Of these 3000, only 7 were restricted due to LBAM finds. These were shipped to markets without LBAM restrictions. Based on current agriculture experience and in the context of modern agriculture practices, natural biological controls and controls used for other pests typically provide adequate agricultural controls for LBAM needed to meet US and international quarantine restrictions. Occasional, specific controls (e.g. insect growth regulators) for the leafroller complex in general are used, whereas pheromones are only used for monitoring and population suppression but not for eradication.

As previously noted, the transient nature of LBAM as a pest and its ability to be effectively mitigated through production-level management practices was supported by USDA and US trade officials in (Dunkle 2007; Fedchock 2007).

In practice, it appears that CDFA has never successfully eradicated a species. According to standard integrated pest management texts (Flint and Gouveia 2001; Norris et al. 2003) eradication is defined as “complete elimination of a species from a particular area.” Since 1982, CDFA has implemented 274 eradication programs against 12 species of pests, not including for LBAM. Eradication programs for every one of these pests have continued until 2006 (see Attachment 1). In the case of medfly eradication programs, CDFA has often considered every new outbreak of medfly as a separate event rather than the redetection of existing populations, even when such "outbreaks" occurred in or near areas in which successful eradication was declared only weeks before (Carey 1996; CDFA 1989). Thus, in reality, these programs are long-term pest management programs, that, for funding purposes, are defined as eradication programs. This gives USDA/CDFA access to emergency funds to which they may otherwise not have access, but under false pretenses that eradication is the goal. It is the "emergency" status of the program that justifies the implementation of pest eradication programs in residential areas, the obviation of the environmental impact reviews, and the risk of subjecting residential areas to exposure to pesticides that would normally be restricted to agriculture use. If emergency funds were available for control rather than eradication programs, such funds could have been used for effective monitoring to determine if eradication was in fact needed or if current agriculture practices provide sufficient control, before moving into an emergency-eradication program. Thus, consideration should be given to modifying national agriculture policies in such a way that would allow emergency funds to be allocated for appropriate monitoring and control measures, not just emergency eradication programs that put a tremendous burden on the farming community and expose residential areas to perhaps unnecessary application of agricultural pesticides.

LBAM Invasion Biology

The USDA and the CDFA believe that because the LBAM only occupies limited areas in California that it is possible to eradicate it. They also noted that because LBAM was a “new introduction”, claiming that it was not in California prior to 2006, that they had a “short window” to eradicate it. According to CDFA entomologist Bob Dowell, this short window was defined as 2 to 3 years (Dowell 2008a). This opinion is not widely shared by entomology experts who believe that the populations of LBAM identified to date, which likely represent only a fraction of the diverse populations in California, are too widespread for eradication to be successful.

LBAM was first identified in California in July 2006 by retired entomologist Jerry Powell who caught the first confirmed specimen of LBAM in his backyard insect traps in Berkeley. According to Powell:

> *"Because it's a general feeder -- it's polyphagous -- it doesn't seem to me there's much point in quarantining things, especially after they've found it all around."*

USDA entomologist John Brown echoed a similar opinion:

> *"By the time Jerry collected this thing in his backyard, clearly it had been established in the Bay Area for a long time…* “

While it is normal to have dissenting opinions among scientific experts it appears that only those experts utilized by USDA in the development of the eradication program and those employed by CDFA to implement this program believe eradication can be accomplished. Rather than simply pitting one scientific opinion against another it is important to look at the basic principles of pest invasion biology to determine the predictability of eradication of a species to succeed.

Pest populations can be described in three primary categories "infested zones", "transition zones", and "uninfested zones". Each is characterized by varying levels of detectability, as determined by trapping mechanism. This is significant considering CDFA's assertion that LBMA is a recent introduction into California. In the heart of infested zones, detectability is very high due to the relatively high level of saturation of the pest. However, the ability to detect the pest proportionately decreases with increasing distance from the center of the most dense infestation into the transition zones with only a marginal ability to detect sporadic individuals and the outer edges of the transition zones having established populations but at densities that, without extensive trapping, will remain undetected for years or decades (Sharov 2004). LBAM was not detected in California prior to 2006 because trapping was very limited, field personnel did not know how to distinguish LBAM from native brown moths, which are almost identical, and/or because of populations that were at a sub-detectable level.

Principles for successful eradication are outlined in the scientific literature and consist of three primary phases: (1) the attack phase, during which the organism to be eradicated is attacked with selected control measures in order to interrupt transmission; (2) the consolidation phase, during which residual or imported cases are sought and eliminated; and (3) the maintenance phase, during which careful surveillance maintains the eradication is achieved (Yekutiel 1981). In the world of pest eradication this would equate to population reduction, prevention of reintroductions at ports of entry, control of transport through transport channels (monitoring at state borders of entry), and continued and effective monitoring. These principles were emphasized by the USDA’s LBAM Technical Working Group. Agriculture experts in New Zealand, further identified the agricultural conditions that need to be met in order for eradication to be achieved:

1. Extensive, even, and complete coverage of the pheromone.
2. Uniform blocks of a single crop.
3. Uniform topography (no canopies, slopes, hills or valleys).
4. Low population density of target pest (not too concentrated).

These critical conditions have not been met with regards to the current LBAM eradication program. Pheromones cannot be effectively used across large diverse areas with varying canopy heights, mixed species composition, and varying terrain areas, indicative of the Monterey-Santa Cruz-San Francisco areas. This inability for eradication of LBAM to be successful has been noted by two pre-eminent entomologists; Professor of entomology, Dr. James Carey, University of California, Davis and Dr. Derrell Chambers, a 44-year pheromone expert with USDA (retired). In testimony to the California District Court (2007), Professor Carey noted that eradication of LBAM in California was "virtually impossible" further stating:

> "…even under optimum circumstances, eradication of a species is an enormous challenge. Optimum factors in pest eradication include small, well-delineated populations; effective eradication tools; highly effective monitoring techniques; support of multi-year programs."

In testimony before the California Senate Environmental Committee, Dr. Chambers stated:

> "I believe the LBAM project should be challenged on all these issues, but I am particularly concerned that the issue of efficacy has not been sufficiently questioned…Mating disruption for eradication of LBAM, even with the recommended supporting tactics is unlikely, and certainly has not been adequately tested… "

Interestingly, CDFA now acknowledges the presence of LBAM in California for several years (Dowell 2008b; Kawamura 2008) suggesting that the previously estimated "short window in which they could eradicate is gone. More recently CDFA spokesperson Steve Lyle (2008) noted that their window of opportunity to eradicate is not known, suggesting, like the hundreds of other "eradication" programs implemented by CDFA, will be perpetual.

Other critical considerations for a successful eradication program include the availability of financial and technical resources, complete access to infested areas (which requires public support), the target pest must be susceptible to control procedures (as a leafroller LBAM has a large degree of protection from aerial sprays and chemical treatments), and restoration of the normal habitat if the ecosystem is damaged by the eradication program, otherwise other invasive pests will arise further disrupting the native ecosystem (Myers et al. 2000). In California the populations of LBAM are not well delineated, pheromones have never been used to eradicate a species, no pesticide, pheromone or organophosphate, is ever 100% effective at controlling or killing a species, insects are known to specifically develop resistance against pesticides making them more difficult to control, LBAM has been shown to become resistant to organophosphates (Suckling et al. 1984; Thomas 1987) and other leafrollers have been shown to become resistant to pheromones (Tabata 2006). Therefore, for these and the other reasons presented, the belief that LBAM can be eradicated is not supported by the overwhelming majority of scientific literature, expert opinion, and agricultural experience. The choice to initiate an eradication program is not based in science but politics and emergency funding.

Solution: Reclassification of LBAM

In light of the reviews of the biology of LBAM along with clear indications that it is not a pest of significant economic consequence to agriculture or native flora, the simplest solution to the problem of LBAM is for the USDA to reclassify LBAM to a pest not requiring quarantine thus harmonizing with most international markets such as the European Union and United Kingdom and maintain monitoring programs to ensure. Most other countries only consider LBAM a quarantine pest based on the need to meet the zero-tolerance of the US. Some exceptions, such as Japan maintain quarantine restrictions against all pests and require imported commodities to free of all pests.

Conclusion: Negotiations with Trade Partners

Soon after the identification of LBAM in California, agricultural trading partners such as Canada and Mexico issued Phytosanitary Advisories against agricultural products in select counties where LBAM was located. Trading partners did not mandate for an eradication program to be implemented. Rather they require assurance that US exports be free of LBAM. The same basic quarantines apply with regards to domestic commerce of California produce. However, numerous crops including brassica species (broccoli, brussel sprouts, cabbage, etc.), parsley, collards, celery, head and leaf lettuce, spinach, asparagus, carrots, peppers, artichokes, and walnuts, among others, were exempted from interstate quarantines and Mexico recently relaxed export requirements for certain items showing flexibility in the enforcement of quarantine restrictions. The key denominators in obtaining these exemptions is that the crops are either subject to integrated pest management practices which will sufficiently reduce the risk of spread of LBAM, that other management tools that will target Lepidopteran species in general are being used, or that the host portion of the crops are not present (leaves absent or removed; e.g. root crops).

In addition to the flexibility that can be exercised in meeting the phytosanitary restrictions, agriculture officials in Mexico expressed a willingness to remove LBAM restrictions should the US change its own quarantine policies with regards to LBAM or in the presence of new technical and scientific information regarding LBAM (see Figure 2). A review of LBAM within the context of modern agriculture practices provides such information. Communications with Canadian agriculture officials have implied a similar willingness to modify policies in light of changes in US trade restrictions. Thus, it is contingent upon USDA to take the steps needed to declassify LBAM as an objectionable pest and address the broader international trade issues rapidly. For CDFA and California agriculture interests, reclassification of LBAM and discussions with trading partners would end the "Emergency", end the quarantine, and be the most cost-effective way to address the issue of LBAM quarantines. It appears that LBAM does not constitute the declared emergency. Therefore all aspects of this eradication program from the very justification of LBAM as an objectionable pest to the emergency declaration for the implementation of the program should be reconsidered, beginning with a downgrading of the classification of LBAM as an actionable pest. Additionally, national funding policies should be modified to allow for State or Federal funding to agriculture interests for increased monitoring and control of pests in general so that the most appropriate manner of support can be given to the agricultural industry without having to resort to emergency programs.

Figure 2 Excerpt of Phytosanitary Advisory: Mexico

STATE OF CALIFORNIA
DEPARTMENT OF FOOD AND
AGRICULTURE
1220 N Street, Room A-372
Sacramento, CA 95814

PHYTOSANITARY ADVISORY

No. 12-2007

DATE: May 14, 2007

TO: All County Agricultural Commissioners

FILE: Export File

SUBJECT: New Restrictions on the Shipment of Hosts of Light Brown Apple Moth to Mexico

Unnecessary to say that, the present phytosanitary conditions may be modified or harmonized whenever we have more technical and scientific information regarding *E. postvittana,* as well as we receive more information about the evolution status of this pest in the United States.

Finally, please be informed that the aforementioned restrictions will be into effect as of May 10, 2007.

Without further, please receive a cordial greeting.

Yours truly,
The Chief Director

MVZ. ENRIQUE SANCHEZ CRUZ

About the Authors

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Attachment 1 Eradication Programs of CDFA Since 1982

CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE
PEST DETECTION / EMERGENCY PROJECTS

ERADICATION PROJECTS

YEAR	EXOTIC PEST	NUMBER OF PROJECTS
1982	GYPSY MOTH	1
	ORIENTAL FRUIT FLY	1
1983	GYPSY MOTH	9
	ORIENTAL FRUIT FLY	2
1983-84	MEXICAN FRUIT FLY	1
	JAPANESE BEETLE	1
1984	GYPSY MOTH	5
	CARIBBEAN FRUIT FLY	1
	ORIENTAL FRUIT FLY	4
	PEACH FRUIT FLY	1
1985	GYPSY MOTH	2
	ORIENTAL FRUIT FLY	10
1986	ORIENTAL FRUIT FLY	6
	GUAVA FRUIT FLY	1
1987	ORIENTAL FRUIT FLY	5
	GYPSY MOTH	1
	PEACH FRUIT FLY	1
	MEDITERRANEAN FRUIT FLY	2
	MELON FLY	1
1988	ORIENTAL FRUIT FLY	3
	MEDITERRANEAN FRUIT FLY	2
1989	MEDITERRANEAN FRUIT FLY	15
	ORIENTAL FRUIT FLY	12
1990	PEACH FRUIT FLY	1
	MEDITERRANEAN FRUIT FLY	13
	MEXICAN FRUIT FLY	2
	GYPSY MOTH	2
	ORIENTAL FRUIT FLY	4
1991	MEDITERRANEAN FRUIT FLY	1
	ORIENTAL FRUIT FLY	3
	MEXICAN FRUIT FLY	1
1992	MEDITERRANEAN FRUIT FLY	3
	ORIENTAL FRUIT FLY	2
1993	ORIENTAL FRUIT FLY	8
	PEACH FRUIT FLY	1
	MEXICAN FRUIT FLY	2
	MEDITERRANEAN FRUIT FLY	8
	GUAVA FRUIT FLY	1
1994	GUAVA FRUIT FLY	1
	MEDITERRANEAN FRUIT FLY	4
	ORIENTAL FRUIT FLY	1
1995	MEDITERRANEAN FRUIT FLY	cont. of 94
	MEXICAN FRUIT FLY	2
	ORIENTAL FRUIT FLY	3
1996	GYPSY MOTH	2
	ORIENTAL FRUIT FLY	2
1997	GUAVA FRUIT FLY	1
	GYPSY MOTH	1
	MEDITERRANEAN FRUIT FLY	1
	MEXICAN FRUIT FLY	1
	ORIENTAL FRUIT FLY	9
	PEACH FRUIT FLY	1
1998	MEDITERRANEAN FRUIT FLY	4
	MEXICAN FRUIT FLY	1
	ORIENTAL FRUIT FLY	5
1999	MELON FRUIT FLY	1
	GUAVA FRUIT FLY	1
	MEXICAN FRUIT FLY	2
	ORIENTAL FRUIT FLY	2
2000	GUAVA FRUIT FLY	1
	ORIENTAL FRUIT FLY	4
2001	GYPSY MOTH	2
	GUAVA FRUIT FLY	5
	MEDITERRANEAN FRUIT FLY	1
	MEXICAN FRUIT FLY	1
	ORIENTAL FRUIT FLY	6
	PEACH FRUIT FLY	2
2002	GUAVA FRUIT FLY	2
	MEXICAN FRUIT FLY	5
	ORIENTAL FRUIT FLY	5
	JAPANESE BEETLE	1
2003	GUAVA FRUIT FLY	1
	MEXICAN FRUIT FLY	3
	ORIENTAL FRUIT FLY	4
2004	ORIENTAL FRUIT FLY	8
2005	ASIAN GYPSY MOTH	1
	ASIAN LONGHORNED BEETLE	1
	GUAVA FRUIT FLY	4
	MEDITERRANEAN FRUIT FLY	4
2006	GUAVA FRUIT FLY	1
	ORIENTAL FRUIT FLY	11
	MEXICAN FRUIT FLY	1
	PEACH FRUIT FLY	1
	JAPANESE BEETLE	1
	DIAPREPES ROOT WEEVIL	1
2007	GUAVA FRUIT FLY	1
	JAPANESE BEETLE	1
	MEDITERRANEAN FRUIT FLY	3
	MEXICAN FRUIT FLY	2
	ORIENTAL FRUIT FLY	5
	TOTAL NUMBER OF PROJECTS	274

cdfa

274 "eradication" programs implemented by the State of California are against 9 pests beginning in 1982. All of these pests except the Asian gypsy moth eradication program, which was begun in 2005, were still being "eradicated" in 2000-2007.

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