WHITE PAPER

PAST, PRESENT AND POTENTIAL FUTURE PEST AND DISEASE PROBLEMS AFFECTING CALIFORNIA AVOCADOS AND THEIR IMPACT ON PUBLIC HEALTH, SAFETY, THE ENVIRONMENT AND THE ECONOMY

California AVOCADO COMMISSION

I. THE CALIFORNIA AVOCADO INDUSTRY

Avocado production in California can be traced back to 1856, when the first avocado tree imported from Nicaragua was planted near Los Angeles. During the 1880s and 1890s, avocado varieties were imported from Mexico and seedlings were grown.

The commercial industry in California began around 1910; by 1920 over 500 acres of avocados were recorded in the state. Since then, the California avocado industry has experienced three periods of expansion. Commercial avocado acreage increased to 13,565 by 1947 and after a brief pause, began to grow again during the 1950s, reaching 21,921 acres in 1964.

Resulting large crops during the late 1950s and early 1960s brought depressed markets and a low level of new plantings during the mid-1960s. In 1961, a state marketing order was put in place to increase demand for California avocados. By the late 1960s, avocados were being grown on approximately 22,000 acres and production reached 80 million pounds, with the total volume of the Hass variety exceeding the volume of Fuerte avocados for the first time. The 1971-72 avocado crop of 51.7 million pounds was valued at $24.6 million.

Increased plantings from 1968 through the 1970s fueled an expansion in bearing acreage, which reached a peak of 76,307 acres in 1987. After 1987, avocado acreage declined steadily to 58,971 in 2001-02. Acreage reductions were largely the result of lower avocado prices during the 1980s, increased urban pressures, and high land and water costs. By 1994, the Hass variety accounted for over 80% of all production. A conservative estimate of the value of California's bearing acreage of avocados at that time—61,254 acres—totaled over $1 billion.

California avocados are presently grown on 63,082 acres, with the Hass variety accounting for 94 percent of total volume. In the 2005-06 crop year, avocado production reached a record 600.9 million pounds, worth $341.2 million to the state's growers. The industry is presently composed of approximately 6,500 growers with an average farm size of about 10 acres.

The California Avocado Commission is organized under the provisions of Division 22, Chapter 5, beginning with Section 67001 of the Food and Agricultural Code, and has been in existence since 1978. The Commission derives all of its funds from statutorily mandated grower assessments. It is broadly responsible for marketing and promotion, issues management, production research and communications for the benefit of the state's avocado growers. It operates with an annual budget of approximately $15 million.

II. HISTORIC PESTS AND DISEASES AFFECTING AVOCADO

The California avocado industry has been relatively free of pests and diseases throughout its history. When a problem did arise, the industry turned to integrated pest management strategies that relied on biocontrols, rather than pesticides, to keep insects in check. In 1932, when the California avocado industry was still in its infancy, the California Avocado Association wrote:

> "it is thus apparent that the avocado growers in this state are still relatively free from the more serious insect pests attacking that crop . . . most [of which] have been introduced from foreign countries. These conditions seemingly justify the active interest and support of the avocado industry in the proper maintenance of an adequate and efficient protective quarantine service in California."

At the time, it had been 50 years since the first plant quarantine law was passed by the State of California, some 30 years prior to similar federal legislation. Listed as pests of concern by the Association were fourteen different species of scale insect (most occurring in Mexico); the Mediterranean fruit fly; the avocado weevil (*Heilipus sp*.); the avocado moth [*Stenoma catenifer*]; and the borer [or stem weevil, *Copturus aguacatae*].

Remarkably, the low incidence of pest infestation in the California avocado industry lasted until the 1990s. A Pest Management Strategic Plan prepared in 2004 found:

> "pests of avocados, relative to those in other tree fruits, have been historically light—until the recent introduction of two exotic species, avocado thrips and Persea mite.[1] A biologically-based system of integrated pest management had served the growers very well until these recent introductions."

The report goes on to state: "biological control has been the foundation of pest management in avocados for . . . decades, resulting in minimal pesticide use relative to other commodities." This is echoed in an avocado industry Crop Profile developed in 1999:

> "with the important exception of the current threat from avocado thrips, most insect pests are controlled through the presence of natural predators and the industry's cultural practices. For example, all chemical insecticides are applied to less than 0.5% of California's avocado acreage with the exception of chemicals that are currently used to treat avocado thrips. Though . . . a few . . . insect pests are serious concerns to California's avocado industry, most insect threats are occasional and control methods are initiated only when careful monitoring indicates a need for action. Similarly, chemical fungicides are applied to less than 2% of California's avocado acreage."

In a 2003 publication, Exotic Pests and Diseases, scientists noted:

> "biological control has succeeded in California avocado orchards because minimal pesticide use has not disrupted natural pest control by indiscriminately killing natural enemies. The luxury afforded to avocado growers by successful biological control has recently been disrupted by two new pests, the Persea mite and avocado thrips. These two pests have moved growers from biologically based pest control to insecticide-reliant management strategies."

[1] A complete account of the impact of these recent introductions follows in the next section.

The three resources list only a small number of established species as being significant: avocado thrips, Persea mite, greenhouse thrips, western avocado leaf roller, brown mite, omnivorous looper, omnivorous leaf roller, and glassy winged sharpshooter are insects of concern, and avocado root rot and collar rot are the most serious diseases affecting avocados. Foliar fungal diseases are rarely of commercial significance.

III. Recent Pest and Disease Introductions

It is no coincidence that the first serious introduction of exotic pests of avocados into California occurred during the 1990s. To further national trade objectives during this period, long-standing pest exclusion principles were replaced with more flexible phytosanitary policies, while increased commercial cargo and passenger traffic created new pathways for pest introductions, taxing existing monitoring systems and reducing their efficacy. After being relatively pest-free for its entire history, the California avocado industry now faced two major pest infestations in a span of six years.

The Persea mite, *Oligonychus perseae*, was discovered attacking avocados in San Diego County in 1990. By the summer of 1993, the pest had spread north to Ventura County and by 1996 it was established throughout the growing region. Native to Mexico, the insect was first described in 1975 from specimens collected from avocado foliage intercepted from Mexico at an El Paso, Texas quarantine facility. Methods used to control the Persea mite include cultural techniques and biological and chemical treatments. Costs for all methods combined are estimated at $11.9 million annually.

The avocado thrips, *Scirtothrips perseae*, was first noticed in California in July 1996 in a Ventura County avocado orchard. In less than a year, the thrips spread north and south, and was first recorded in San Diego County in May 1997. Two months later, the insect was causing significant damage and had infested 95 percent of the avocado acreage in California.

Warning signs preceded the invasion of the avocado thrips. In 1971, a quarantine interception at the Port of San Diego resulted in the collection of a single female specimen of an undescribed species of *Scirtothrips* on avocados from Oaxaca in southern Mexico. This single specimen is very similar in appearance to the avocado thrips found in California. Subsequent foreign exploration efforts by entomologists have shown that *S. perseae* has a narrow geographic distribution, and is found throughout the avocado growing region between Michoacan, Mexico and central Guatemala.

The avocado thrips has been called "the most injurious pest of California avocados." The pest attacks young avocado foliage and fruit, causing the fruit to drop from trees. Damaged fruit is often downgraded or rendered unmarketable. Economic loss attributable to the avocado thrips comes from the scarring of immature fruit and increased pest control costs.

By 1998, average losses due to thrips feeding damage in untreated, infested groves reduced industry revenues by 12 percent. Producer costs increased by about 4.5 percent when *S. perseae* populations required management. In the short run, producers cannot fully adapt to increases in production costs and the annual cost of *S. perseae* to producers with an infestation is estimated to be $8.65 million. In the long run, producers are able to put fully reallocated resources to their most efficient use and the annual cost of *S. perseae* is

calculated to be $5.22 million per year. Presently there are no known natural enemies that can effectively control the avocado thrips.

The avocado lace bug, *Pseudacysta perseae*, was first described in Florida in 1908. For most of the years since its description, the pest has been regarded as having limited distribution, primarily in peninsular Florida, and being of only occasional minor economic importance. Recently, the number of complaints about its damage to avocado leaves has increased in Florida, and damaging populations have been reported in Puerto Rico and the Dominican Republic. The avocado lace bug was detected on backyard avocado trees in the Chula Vista and National City areas south of the City of San Diego in September 2004. By early 2005, avocado lace bugs were found to have infested a 250-square mile area in Sand Diego County, threatening commercial avocado groves. It is especially troubling that the pest appears to be thriving outside its normal environment (it is native to hot humid tropics and subtropics). Spread of this pest would present yet another economic burden on the already beleaguered California avocado growers.

The Diaprepes root weevil, *Diaprepes abbreviatus*, also threatens California avocado groves. This large, colorful weevil, native to the Caribbean region, was accidentally introduced into central and south Florida in 1964 in an ornamental plant shipment from Puerto Rico. Since then, it has spread throughout Florida, where it sometimes causes serious damage to citrus trees. Diaprepes root weevil feeds on more than 270 species of plants, including avocado. Adult weevils feed on the leaves of plants and their larvae move underground to feed on plant roots. The larvae can encircle the root systems of trees, cutting off the supply of water and nutrients, eventually killing the host plant. Diaprepes has been intercepted a number of times in California since 1974, and infestations found recently in Los Angeles, Orange, and San Diego Counties recently triggered area quarantines. Field scientists with CDFA have confirmed Diaprepes root weevil feeding on Hass avocado trees in the Encinitas Quarantine area and also in commercial lemon groves. Eradication efforts are underway, but state resources to combat this pest are limited.

IV. POTENTIAL PESTS AND DISEASES OF CONCERN

New exotic pest introductions are a constant threat. The possibility of an infestation arising from an existing pathway—such as a commercial channel for the importation of fruit—is evident from staggering number of insects detected each year in surveys conducted in Mexico and other locations where imports originate. In addition, new pathways are a potential source of pest and disease introduction for species about which little is known.

In 1997, for the first time in history, the U.S. Department of Agriculture (USDA) adopted regulations permitting the importation of Hass avocados from Mexico under certain conditions. USDA's Mexican Avocado Import Program is designed to mitigate risks associated with eight insect pests (three fruit flies: *Ceratitis capitata, Anastrepha ludens, A. striata*; three seed weevils: *Conotrachelus aguacatae, C. perseae,* and *Heilipus lauri*; one stem weevil: *Copturus aguacatae*; and one seed moth: *Stenoma catenifer*) deemed to be of quarantine significance and capable of following the avocado pathway. Although none of these pests have been detected in imported avocados since the program began, surveys conducted each year in Mexico by USDA in backyard and commercial orchards continue to produce an alarming number of specimens. Since the inception of the import program, over 2,100 stem weevil detections have been reported by USDA. The

prevalence of these insects is not diminishing. In fact, stem weevil detections from backyard orchards in 2002 totaled 145 (latest available data), the greatest number found in any single year since the program began. As more orchards are certified for export each year, the possibility of infestation of stem weevils via migration from backyard trees to certified orchards increases.

Significant deficits in knowledge on the taxonomy, ecology, and biology of the arthropod fauna on avocados in exporting countries also present a problem. For example, the insect fauna of Mexican grown avocados appears to be poorly documented and understood. Even USDA is uncertain about the distribution of certain quarantine pests in Mexico, including the avocado seed moth, *Stenoma catenifer*. USDA's May 24, 2004 Risk Assessment alternately states that the seed moth "probably doesn't occur" or is "not reported from Michoacan," then later claims it "occurs widely over Mexico, but is limited there to avocados grown below 1000 m in elevation and, apparently, does not occur in the export program area." This statement is a revision of the following sentence that appears in a June 2003 version of the Risk Assessment: "The seed moth occurs widely over the export area, but is limited there to avocados grown below 1000 m elevation." Most unsettling is the fact that all of these statements cite a single scientific study as the relevant source (Cervantes-Peredo, 2000).

In addition to the threat posed by pest species that are routinely detected in surveys, enormous risk, in the form of little known or newly described species, seemingly waits just outside our door. According to University of California (UC) avocado researchers, over 60 species of phythophagous thrips in at least 17 genera have been recorded from avocados in areas outside of California. A total of 38 phytophagous thrips species have been collected from avocados in Mexico by Johansen et al. (1999), but only seven species, *Frankliniella bruneri*, *F. chamulae*, *Heliothrips haemorrhoidalis*, *Pseudothrips perseae*, *Scirtothrips aguacatae*, *S. kupandae*, and *S. perseae* were considered pests (Hernandez et al., 2000).

There are other potentially serious avocado pests in Central America that are unknown entities that may be able to establish in California and inflict severe damage to commercially grown avocados. Foreign exploration conducted by UC researchers in Mexico for avocado thrips and its natural enemies has revealed one new species of *Frankliniella* (the western flower thrips group, which are serious disease vectors) and at least one other *Frankliniella* species, whose identity cannot be confirmed but could potentially be a new species as well. In addition, there is at least one species of *Scirtothrips* whose taxonomic status is undetermined, which could be a new species and a potential pest.

One UC entomologist is presently in Guatemala research avocado seed moths. Survey work conducted to date has revealed a variety of beetles, flies and moths feeding on avocados, several of which represent a serious invasion threat to California avocados. The researcher discovered at least four species of moths feeding on avocado fruit, two of which—*Stenoma catenifer* and Cryptaspasma sp.—are relatively common in some commercial Hass avocado orchards managed with broad-spectrum insecticides like methyl parathion. “The damage to Hass avocados caused by Stenoma can be spectacular in some instances, with up to 40 percent of fruit still hanging in trees showing some level of feeding damage,” the researcher said. “while Stenoma is a well-known avocado pest, the Cryptaspasma sp., although not officially recognized as an avocado pest in the majority of sources cataloguing avocado fruit pests, has the potential to be a significant threat to California avocados should it successfully invade and establish populations.” California currently has no avocado fruit

feeding pests, a fact that the researcher says most likely can be attributed to a ban on avocado imports from Mexico and Central America that had been enforced since 1918.

Potential threats are not limited to arthropods. Researchers specializing in diseases of avocados have stated:

> "a rough list [of diseases not in California] include the unknown Nectria canker from Mexico and the new Phellinus root rot disease in Australia. Other well known diseases not yet identified here include Duke 6 stem pitting, *Pseudocercospora* leaf spot, silver spot, sooty blotch, tar spot, *Phytophthora boehmeriae*, *Phytophthora hevae*, *Rosellinia* strains from Spain, *Rosellinia bunodes*, *Rosellinia pepo*. Some of these may be small problems in their homeland but mushroom to major problems if not contained by climatological or biological factors present where they originated."

New species are being described with increasing frequency. A recent report documented "a species new to science, *Bruggmaniella perseae* Gagne" after the insect was found infesting avocados in Columbia and Costa Rica. The insect was characterized by the researchers as a severe pest of avocado.

USDA has conducted its own assessment of those pests and diseases potentially affecting Mexican avocados. Ultimately, after acknowledging the presence of 71 different species documented in the scientific literature, the Department winnows the list of species of concern down to eight, doing so on the basis of certain assumptions about the species' ability to travel the import pathway:

> "we identified all Mexican avocado pests with potential economic importance in the United States. All pests listed in Tables A-1 (pathogens) and A-2 (arthropods) are present in Mexico. Of the 26 pathogens listed in Table A-1, 3 do not occur in the United States (two other pests are not identified to species and could be in the United States. If they are identified, they could be re-analyzed for quarantine significance in the future). Of the arthropods in Table A-2, 45 are quarantine pests. From the list of quarantine pests, we eliminated those pests that are unlikely to follow the pathway prior to mitigation by the modified systems approach, including cultivar resistance."

USDA's record is far from flawless with respect to such assessments. For example, USDA prepared a risk assessment for the importation of Ya pears from China in January 1997, which listed two species of *Alternaria* fungi as being potential risks. The Department proceeded to develop a protocol to mitigate these risks, but in December 2003, it was forced to initiate a major recall of Chinese Ya pears after a new species of fungus, *Alternaria sp.* nov. Roberts, was detected in supermarkets across the U.S., including retail stores in Wenatchee, Washington, in the heart of the country's foremost deciduous fruit production area.

Importantly, only a small number of insects can give rise to a major infestation. University of California avocado researchers point out:

> "the small numbers of pests intercepted on avocado plants and fruit that are moved into the United States from Central America suggest that founding populations of pests may often be very small. Work on thrips used for the biological control of weeds has demonstrated that 33 percent of releases of just 10 thrips into a permissive environment can result in establishment and proliferation (Memmott et al. 1998). The greater the frequency of small introductions, the higher the likelihood of establishment in comparison with few introductions of large numbers of thrips that can become extinct by chance (Memmott et al. 1998). This scenario from weed biological control may apply to the establishment of new avocado pests in California where frequent introductions (either through legal or illegal routes) of small numbers of pests may ultimately lead to their establishment."

USDA, by contrast, is quick to dismiss such notions, taking the position that conditions must be ideal to support the introduction and establishment of new species, despite knowing that history tells us otherwise. On November 30, 2004, USDA amended its regulations governing the importation of Hass avocados from Mexico. The new regulations took effect on January 31, 2005. In a revised risk assessment issued November 19, 2004, USDA explained that, according to its risk assessment model, fewer than 393 infested avocados would enter the entire U.S. when the new regulation was implemented. Industry members and scientists find that number most disconcerting. USDA counters:

> "even if some infested avocados entered the country, the likelihood of pest establishment and spread would require that: 1) the infested fruit must be in close proximity to host material; 2) the pests must find mates; 3) the pests must successfully avoid predation; 4) the adult pests must find host material; and 5) the climatological and microenvironmental conditions must be suitable. These factors substantially reduce the likelihood of establishment."

Still, researchers believe that the devastating infestations of Persea mite and avocado thrips experienced by the California avocado industry could easily have resulted from the introduction of a small number of pests.

On February 1, 2007, shipments of Hass avocados from Michoacan, Mexico were allowed to enter California for the first time since 1914. Soon after the first trucks began to arrive, CDFA inspection personnel at highway checkpoints intercepted live armored scale insects on Mexican avocados. During the first month of shipping, 13 percent of shipments inspected at CDFA checkpoints were found to contain invasive armored scale species, including *Acutaspis albopicta*, *Aulacaspis tubercularis*, and undescribed species of the genera Abgrallaspis/Diaspidiotus. Although the CDFA response to these actionable pests was to reroute the trucks out of state or fumigate the shipments upon the owner's election to do so, the interceptions illuminated an alarming conflict between federal and state plant health regulations.

Unlike CDFA, USDA does not regulate armored scale insects. USDA's decision to allow these pests in commerce rests on a 1985 risk assessment that lacks scientific rigor and the influence of politics involving trade of agricultural commodities. The conflict of laws serves to undermine California's own plant protection policies, since some Mexican avocado shipments enter the state through federally-operated facilities, such as the Otay Mesa port of entry or the Port of Los Angeles. It is the long-standing policy of the federal government that products entering via U.S. ports of entry remain under federal jurisdiction until they reach

their final destination. Consequently, CDFA lacks apparent authority to inspect product that remains in transit after having cleared a federal port of entry. At the California avocado industry's urging, CDFA presented a proposal to USDA whereby the existing Cooperative Agreement between the two agencies would be modified to allow federal inspectors to turn over scale-infested loads of Mexican avocados to CDFA for disposition. As of this writing, USDA has not yet acted on the CDFA proposal. There is growing concern that USDA will decline to accept the terms as outlined by CDFA.

V. THE IMPACT OF EXOTIC PEST INTRODUCTIONS

The impact of exotic species invasions is well documented. Beyond the direct costs associated with eradicating a species before it becomes established, the effects of an infestation can be measured in terms of long-term economic influences, welfare losses, and environmental impacts.

The California Department of Food and Agriculture (CDFA) has carried out nearly 250 exotic pest eradication actions since 1975. Department policy is to act quickly when an exotic pest infestation is discovered to prevent further expansion and establishment of the pest. The Mexican fruit fly outbreak that occurred in Valley Center, California in 2003 serves as an example of such a response. Total direct costs of the Valley Center Mexican Fruit Fly Quarantine are placed at over $28 million, including $15 million for eradication costs, $12 million in crop losses, and $1.4 million in grower-applied bait treatments. The indirect local economic impact has been estimated at $31 million, and CDFA placed the total potential impact of the infestation at $1.9 billion.

Repeated outbreaks of the Mediterranean fruit fly have been just as costly to the state. According to a recent University of California study that examined the economic impact of Mediterranean fruit fly on California agriculture, the state "would stand to lose $538 million in output, $259 million in total income, $283 million in gross state product, and 7,900 jobs" should the insect become established here. Further, the study found "a general infestation would impose up to $341 million in additional production costs on California agriculture" and "consumers could expect to pay up to $68 million in the form of higher food costs."

Several recent studies have examined the effects of an exotic pest infestation impacting the domestic avocado industry. Welfare effects of pest shocks on the U.S. avocado industry have been estimated using an equilibrium displacement model, in which a system of demand and supply conditions are plotted in log-linear form to determine how equilibrium quantities, prices, and other variables respond to shocks, e.g. increases in production costs when an exotic pest becomes established.[2]

In general, as price goes up, growers respond with greater supply, and consumers demand less. When a pest infestation occurs, the supply curve shifts to a new equilibrium point where less is produced and prices have increased. The net effect is that growers produce less and charge more. Some of the additional production costs can be passed on to consumers in the form of higher prices, which explains why consumers are worse off after an exotic pest infestation. In the first few years after the infestation of avocado thrips, industry estimates

[2] Grower costs for treatment often include the purchase of bio-control agents or commercial pesticides, equipment and labor, and professional services from a pest control advisor or a flying service for the application of treatments by helicopter or fixed wing aircraft.

place grower losses close to $50 million, primarily from downgraded quality and fruit rendered unmarketable. Prices for standard avocados plunged by 40 percent. The change in net welfare for California, therefore, is always negative when a pest infestation occurs.

The introduction of an exotic species may also increase the pesticide load in the environment. Successive waves of infestation by nonindigenous pests like the Persea mite and avocado thrips have forced growers to treat these pests with insecticides. Aerial pesticide applications are frequently necessary because avocados are often grown on steep hillsides. CDFA estimates that over two-thirds of all pesticides used on agricultural crops in California today are aimed at pests that originated from outside the state and have become established here. While the effects of increased pesticide loads are not fully known, the industry's preference is to avoid contributing chemical residues, in any form, to the environment.

There is also the potential for the destruction of existing, commercial orchards in the event of an exotic pest introduction. For many of the avocado pests found in Mexico, there is no known or registered pesticide treatment available in the U.S. to control or destroy them. For example, in Mexico, methyl parathion, a toxic organophosphorus insecticide with serious health effects, is used for control of the stem weevil and seed moth. The U.S. Environmental Protection Agency (EPA) revised its maximum pesticide residue tolerances on methyl parathion in 2001, revoking its use on avocados (7 C.F.R. § 180.121). Another chemical control for these insects, Malathion, is presently under EPA review and is likely to be phased out. Even with these chemicals in the arsenal of control measures available to the Mexican avocado industry, stem weevils remain prevalent in the avocado-growing regions of Mexico. Without such treatment options, the likely response to an infestation in California would be the destruction of infested commercial trees. Once that occurs, land must remain fallow for several years before replanting. Then, if land is replanted, it will take approximately 5 years for the trees to come into commercial production. It is well recognized that federal resources are extremely limited, particularly for indemnifying growers or reimbursing them for the loss of their trees and fruit. This is reflected in the special steps taken by Congress to provide such a reimbursement program for Florida citrus growers whose trees were destroyed because of citrus canker (Pub. L. 106-113).

Several other quarantine pests found in Mexico, specifically those in the Family Thripidae, quite possibly could be controlled by chemicals approved for use in the U.S. should an infestation occur, but few of these products have been registered for avocados. The registration process is exceedingly slow—California growers are still trying to obtain full registration for abamectin, the most efficacious chemical for thrips control, from EPA nearly a decade after the first introduction of *Scirtothrips perseae* from Mexico. Authors of the Pest Management Strategic Plan found:

> "trade agreements without adequate scientific support to ensure that phytosanitary policies are supported by credible data, has [sic] placed the California avocado industry at considerable risk of further exotic pest introductions. These factors, and the potential loss of crop protection tools, make today's industry vulnerable. New safety standards set forth by the 1996 Food Quality Protection Act have significantly impacted the availability and use patterns of important crop protection chemicals used in agriculture, especially organophosphate and carbamate insecticides and miticides. While the avocado industry hopes to maintain very low levels of chemical input, the high value of the crop and the current threat from new pests in

> avocados make the availability of these tools important. Minor crops, such as avocados, face challenges in getting new crop protection tools registered. As the costs to conduct required research and register new materials increases, registrants [manufacturers] are less willing to focus on commodities with relatively few acres (as compared to major crops) simply because their return on investment is significantly lower."

It is unreasonable to expect California growers to face the risk of an insect infestation when they are without recourse to combat it.

VI. State Budget Reductions in Pest Exclusion and Monitoring

An additional level of protection—made possible through the California Pest and Disease Act of 2007 and the industry committee it enables—is necessary because state resources are stretched thin and prospects for improvement are not bright. CDFA reports that its biological pollution exclusion and eradication network has not kept pace with increased commercial cargo and passenger movement and the risks posed by this activity. From 1980 to 2000, international passenger arrivals rose by 127 percent. Air cargo volumes are doubling every five to six years. Approximately 365,000 more commercial trucks now cross California's borders each year as compared to 1995 and personal vehicle crossings in 2003 were up by a staggering 17.8 million over 1995 levels. "With each additional ship, plane, train, truck, bus, car, and person entering the state, California's exposure to biological pollution increases substantially," CDFA has said.

Unfortunately, after increasing during the 1990s, state funding for biological pollution exclusion activities has declined. During recent years, the biological pollution exclusion network has absorbed baseline reductions of 330 positions and $29.2 million. From 1921 to 2003, private vehicles entering California were screened for compliance with federal and state agricultural laws in an effort to minimize the introduction of pests that might cause damage to agricultural crops or native plant species. Due to fiscal constraints, CDFA discontinued the private vehicle inspection program in 2003-04 at its 16 inspection stations. It was CDFA's assessment that the private vehicle inspections were the least effective method of controlling pests. Since that time, only commercial vehicles entering the state have been subject to inspections. Three years later, CDFA proposed conducting a two-year pilot program for private vehicles at the Needles inspection station to reassess the risk of pests from private vehicles entering the state. CDFA now reports that the lack of private vehicle inspections may be contributing to an increase in quarantined agricultural products entering the state. On the basis of these surveys, the department wants to conduct a longer pilot program. It remains to be seen if the Legislature will support an extension of the program.

CDFA has stated:

> "to provide California with the greatest level of protection against plant and animal pests and diseases that can adversely impact human health, commerce, and California's precious natural resources, a baseline of funding and activities needs to be maintained. At this baseline, California's efforts match our risk exposure. Anything below this baseline and the costs of eradication of biological pollution that will invade the state becomes overwhelming. Put simply: an ounce of prevention is worth a pound of cure."

Our reality as an avocado industry is that the state, with increasing frequency, is unable to provide the baseline funding referenced by CDFA. Even as industry pursues reversal of this trend and reestablishment of the much needed "ounce of prevention" funded by the state, it must consider all viable options. This includes development of a supplemental self-help program that guards against the introduction of destructive pests and diseases from outside the state while not further victimizing growers by imposing additional financial burdens. The California Avocado Pest and Disease Act of 2007 may well serve this purpose.

VII. VALUE OF INTERCEPTION AND EXCLUSION POLICIES

According to CDFA, "broad outbreaks of plant and animal pests and diseases can have staggering impacts and lasting societal costs, such as the erosion of public confidence in the safety of our food supply." CDFA's Medfly Exclusion Program illustrates the benefits of a comprehensive biological pollution exclusion and eradication network aimed at mitigating societal costs. Between 1980 and 1996, California expended roughly $258 million to eradicate Mediterranean fruit fly infestations. Following the inception of the Medfly Exclusion Program in 1996, only about $4.4 million in eradication costs have been necessary. CDFA's network consists of four components: 1) exclusion activities consisting of interception of quarantine pests at points of entry into California; 2) local surveillance and detection; 3) diagnostic laboratory support; and 4) a rapid detection and response mechanism to control and eradicate pests.

At the federal level, border inspections at U.S. ports of entry have slowed but not stopped the introduction of dangerous plant pests and diseases. A review of USDA records from non-cargo interceptions of Mexican avocados compiled from January 1, 1989 through January 23, 2004 (latest available data) reveals the detection of 742 avocado-specific pests at various U.S. ports of entry. Of these detections, 438 were the avocado stem weevil, *Copturus aguacatae*, 189 were avocado weevils of the genus *Conotrachelus*, 96 were the avocado seed moth, *Stenoma catenifer*, and 19 were avocado weevils of the genus *Heilipus*. Armored scale insects were detected in extremely high numbers; 11,885 interceptions of these insects were recorded during this period. In addition, during the same period there were 13 interceptions of *Anastrepha* species fruit flies, including three in Los Angeles, and one each in Ontario, San Diego, and Miami. Border inspections intercepted both the Persea mite and the avocado thrips on smuggled avocados from Mexico before either pest established in California.

Pests and diseases have also been evident upon inspection of shipments of commercial cargo. USDA interception records for the period from October 1, 2003 through September 13, 2006 indicate the collection of 888 pests or diseases—primarily armored scale insects—from Mexican avocado shipments, 43 specimens from avocados shipped from the Dominican Republic, 2 specimens from Chilean avocados, and one from avocados originating in Nicaragua.

This strongly suggests that interception and inspection strategies can be an effective first line of defense but that more must be done to achieve our goal of pest exclusion. The California Avocado Pest and Disease Act of 2007 is designed to aid in this effort.

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