

Agricultural & Horticultural Resources and Economics

This chapter evaluates the potential physical and economic impacts of LBAM infestation in the context of agricultural and horticultural resources. Economic information is integrated throughout the analysis to show the close relationship between economic factors and physical effects on agricultural and horticultural production, as well as to illustrate the importance of these industries to local economies and the state. The following analysis assesses the environmental setting, regulatory environment, and environmental impacts and mitigation associated with the Proposed Program, as well as potential impacts on agricultural and horticultural resources of not eradicating the pest.

The LBAM has been classified by the CDFA as a Class A pest because of its potential damage to many plant species, its lack of occurrence in other parts of the U.S. or in other countries, and its likely severe impacts on agricultural industries should the pest become established in California (Johnson et al. 2007). LBAM has the potential to cause damage to a broad spectrum of agricultural crops, nursery products, and other plants. Within California, more than 250 fruits and vegetables and over 1,000 plant species are susceptible to LBAM (CDFA 2009). If not eradicated, LBAM may spread throughout California, including the highly productive Sacramento and San Joaquin valleys. In addition to the potential for direct losses of agricultural and nursery crops in affected areas, LBAM infestations have been responsible for import restrictions established by California's trading partners, thereby restricting exports of commodities affected by LBAM.

Absent eradication, the responsibility for LBAM control would default to individual farmers and nursery operators. It is likely that these entities would elect to attempt to control LBAM populations with a range of pesticides, thereby resulting in increased farm and nursery production costs. Conversely, Program alternatives, if successful, would help to maintain commercial agricultural and nursery production, which would provide continued economic benefits and avoid potential economic costs that would hinder the viability of agriculture in affected areas.

Of concern to the public is that both the LBAM eradication and noneradication scenarios may have effects on beneficial insects and organic farming and certification. The public is concerned that some of the pesticides available for LBAM control may have adverse effects on beneficial insects, such as honeybees, that serve as pollinators for agricultural crops. Further, the public scoping indicated a concern that pesticide applications on land proximate to organic farms may result in the loss of organic certification. Finally, the public is concerned that all of the potential direct effects on agricultural and horticultural resources are likely to generate a range of indirect economic effects throughout local economies affected by LBAM.

Two sections follow. The first is Environmental Setting (Section 3.1), which provides a snapshot of existing agricultural and economic conditions in the study area. The second is Environmental Impacts and Mitigation Measures (Section 3.2), which includes the results of the impact analysis.

3.1 ENVIRONMENTAL SETTING

This section presents the baseline economic conditions in the Program Area and describes the agricultural and horticultural resources and associated economic benefits that may be affected by the Proposed Program. It also provides an overview of regulatory considerations, including LBAM-induced quarantines, which are

pertinent for the economic analysis. This information serves as the basis against which the potential impacts of the Program alternatives are evaluated. The data used to establish baseline conditions are from various federal, state, and local sources; details on data sources used may be found in Appendix B, Agricultural/Horticultural Resources and Economics.

3.1.1 Program Areas

For this analysis, the primary Program Area is defined as the 13 counties with LBAM infestations: Alameda, Contra Costa, Marin, Monterey, Napa, San Benito, San Francisco, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, and Sonoma. These counties represent the extent of existing state and federal quarantine orders and would be the focus of LBAM eradication efforts. If eradication efforts are not implemented, the potential LBAM infestation could extend throughout many parts of the state (see Figure 2-1, LBAM Program Area Location). The full area of infestation absent the Program is not certain. Dowell (2008a) asserts that LBAM will continue to spread throughout those areas that can support the insect, which could include most regions California. Consequently, a statewide Program Area is also included in the analysis.

3.1.2 Economic Baseline

The key economic indicators considered in this analysis are employment, major industries, unemployment, and income and earnings for both the primary and statewide Program Areas. Economic data at the industry-level are provided where available.

3.1.2.1 Employment and Major Industries

The primary Program Area covers regions throughout the Bay Area and along the central coast. Based on the urban characteristics of many of these counties, the region represents a large employment base. Table 3-1 shows total employment and employment growth between 1990 and 2006. The primary Program Area supported approximately 5.0 million part- and full-time jobs in 2006, which represented 24.6 percent of statewide employment (Bureau of Economic Analysis 2006a). The largest number of jobs was in Santa Clara County at more than 1.1 million and representing 22.2 percent of the 13-county total. San Benito County had the smallest employment base with about 23,000 jobs, accounting for 0.5 percent of the total.

From 1990 through 2000, employment in the primary Program Area grew at a compound rate of 1.8 percent annually. However, from 2000 through 2006, employment fell in 5 of the 13 counties and declined 0.7 percent annually across the entire area (approximately 224,000 jobs). The regions that experienced the largest declines in employment were Santa Clara, San Francisco, and San Mateo counties, falling at compound annual rates of 2.2, 1.5, and 1.4 percent, respectively. In contrast, employment for all of California grew over this period by 0.7 percent annually.

Table 3-1 Total Employment and Employment Growth in the Program Area (1990–2006)

County/Area	Employment (Jobs)			Employment Growth (Annual Compound)	
	1990	2000	2006	1990–2000	2000–2006
Alameda	759,394	899,999	887,325	1.7%	-0.2%
Contra Costa	400,160	477,646	497,921	1.8%	0.7%
Marin	149,525	178,591	181,103	1.8%	0.2%
Monterey	202,278	222,474	226,098	1.0%	0.3%
Napa	59,858	83,967	89,677	3.4%	1.1%

Table 3-1 Total Employment and Employment Growth in the Program Area (1990–2006)

County/Area	Employment (Jobs)			Employment Growth (Annual Compound)	
	1990	2000	2006	1990–2000	2000–2006
San Benito	15,618	21,604	23,396	3.3%	1.3%
San Francisco	710,332	767,987	701,472	0.8%	-1.5%
San Mateo	400,117	503,671	461,754	2.3%	-1.4%
Santa Barbara	216,664	249,705	260,283	1.4%	0.7%
Santa Clara	1,044,672	1,282,671	1,121,135	2.1%	-2.2%
Santa Cruz	125,987	149,579	143,545	1.7%	-0.7%
Solano	137,735	160,396	176,167	1.5%	1.6%
Sonoma	206,021	273,645	277,955	2.9%	0.3%
Primary Program Area	4,428,361	5,271,935	5,047,831	1.8%	-0.7%
Statewide Program Area	16,965,207	19,626,033	20,525,491	1.5%	0.7%

Source: Bureau of Economic Analysis 2006a (Table CA04: Personal income and employment summary)

Employment by industry under existing conditions¹ for the primary Program Area is presented in Table 3-2. The largest economic sector in this region was *Other Services*, which employed over 2.6 million people and accounted for over half of the regional job base (Bureau of Economic Analysis 2006b). Other important sectors included *Wholesale and Retail Trade*, providing 12.7 percent of total jobs, and federal, state, and local *Government*, providing 11.5 percent.

In 2006, farm employment in the primary Program Area was 51,183, or 1.0 percent of the 13-county total. Farm employment was highest in Monterey County, 14,826 jobs, which represented 29.0 percent of total farm employment in the primary Program Area. Santa Barbara and Sonoma counties had the next highest proportions of agricultural jobs at 17.4 and 12.5 percent, respectively. Employment attributed to forestry, fishing, and related activities are included in the *Natural Resources and Mining* sector. For the primary Program Area counties, employment attributed “forestry, fishing, and related activities” was 46,631 jobs.

For the state overall, the largest employment sectors in 2006 were *Other Services* at 48.9 percent of statewide employment, *Wholesale and Retail Trade* at 14.1 percent and *Government* at 13.0 percent. The *Farm/Agriculture* and *Natural Resources and Mining* sectors represented, respectively, 1.2 and 1.3 percent of total employment, and the *Utilities* sector supported the fewest jobs at 0.3 percent (Bureau of Economic Analysis 2006b).

¹ Since 1997, most federal agencies presenting industry data utilize the North American Industrial Classification System (NAICS), a successor to the Standard Industrial Classification system. While similar, the systems are sufficiently different as to limit the comparability of data before and after 2000. Consequently, this analysis does not include industry-level historical trends.

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Table 3-2 Employment by Industry in the Program Area (2006)^{1, 2, 3}

County/Area	Farm/ Agriculture	Natural Resources and Mining	Construction	Manufacturing	Wholesale and Retail Trade	Transportation and Warehousing	Utilities	Finance and Insurance	Other Services	Government	Total
Alameda	1,017	1,004	54,277	79,555	130,449	(D)	(D)	35,560	433,212	119,726	887,325
Contra Costa	1,056	2,341	39,367	21,912	68,557	9,490	1,621	37,223	266,008	50,346	497,921
Marin	691	(D)	12,149	3,351	22,467	1,546	251	12,202	113,217	14,412	181,103
Monterey	14,826	30,068	11,016	6,949	27,772	3,768	552	6,370	89,003	35,774	226,098
Napa	3,383	2,784	6,922	11,663	9,900	1,575	170	2,777	40,562	9,941	89,677
San Benito	1,382	(D)	2,473	3,019	3,054	(D)	(D)	586	7,520	2,887	23,396
San Francisco	0	1,053	22,842	13,230	67,035	(D)	(D)	59,077	423,321	98,285	701,472
San Mateo	1,780	912	24,579	31,881	(D)	28,898	(D)	25,555	255,491	32,225	461,754
Santa Barbara	8,891	9,046	15,256	14,945	32,133	3,381	480	8,090	129,279	38,782	260,283
Santa Clara	3,699	2,076	56,899	173,474	145,653	14,930	1,480	37,027	589,949	95,948	1,121,135
Santa Cruz	6,237	(D)	10,100	7,914	21,895	(D)	(D)	4,271	71,636	18,956	143,545
Solano	1,814	1,131	16,276	9,809	27,918	5,458	496	5,931	74,836	32,498	176,167
Sonoma	6,407	2,808	22,754	25,629	39,951	(D)	(D)	11,172	134,291	29,644	277,55
Primary Program Area Total	51,183	53,223	294,910	403,331	641,064	69,046	5,050	245,841	2,628,325	579,424	5,047,831
Percent of Primary Program Area Total	1.0%	1.1%	5.8%	8.0%	12.7%	1.4%	0.1%	4.9%	52.1%	11.5%	100.0%
Statewide Program Area Total	237,799	275,229	1,265,021	1,584,571	2,894,469	541,669	58,698	953,401	10,041,314	2,673,320	20,525,491
Percent of Statewide Program Area Total	1.2%	1.3%	6.2%	7.7%	14.1%	2.6%	0.3%	4.6%	48.9%	13.0%	100.0%

Source: Bureau of Economic Analysis 2006b (Table CA25N: Total full-time and part-time employment by NAICS industry)

¹Industry/sectors based on a summary of NAICS industry classifications

²(D) = Estimate not available to avoid disclosure of confidential information; estimate included in county totals.

³Data not disclosed for individual industries are included in the county totals.

3.1.2.2 Earnings by Industry

This section includes a discussion of earnings by industry for each county in the primary Program Area and state. The measure of earnings by industry is more relevant than total personal income for evaluating the potential economic impacts of the Proposed Program and alternatives because it focuses on wages/salaries of employees and proprietor (or business) income, which could be affected by changes in agricultural production and farm-level expenditures.

Table 3-3 presents earnings by industry in 2006. In the 13-county primary Program Area, earnings were highest in the *Other Services* and *Manufacturing* sectors at \$148 billion and \$49 billion, respectively, accounting for 44.6 and 14.6 percent, respectively, of all earnings (Bureau of Economic Analysis 2006c). Other major sectors included government, wholesale/retail trade, and finance and insurance. Farm-related earnings accounted for 0.6 percent of total earnings in the primary Program Area.

For the state, annual earnings in *Other Services*, *Government*, and *Manufacturing* were \$463 billion, \$180 billion, and \$132 billion, respectively, jointly accounting for 68.9 percent of all work-related earnings within California. The sectors that generated the lowest earnings included *Farm/Agriculture* with \$7.6 billion annually and *Natural Resources and Mining* with \$10.8 billion annually.

3.1.3 Agricultural & Horticultural Resources

This section describes the agricultural and horticultural resources that may be affected by LBAM, including a discussion of organic farming and the role of beneficial insects in agricultural production. This section also provides an overview of the various programs and policies applicable to agriculture in California.

3.1.3.1 Host Crops and Plants

Many plants are known to serve as hosts to LBAM, including a number of horticultural and agricultural commodities. The CDFA has developed LBAM host lists that identify 143 horticultural and 50 agricultural species (see Appendix A, Host Plant Species). For this analysis, the host lists were cross-referenced to horticultural and agricultural commodities reported in county agricultural commissioner and organic production reports to focus on production and value data specific to LBAM hosts; this revised list was approved by CDFA staff. Table 3-4 shows the LBAM host list used in this economic analysis organized into 12 different commodity groups. See Appendix A for the entire host plant list.

3.1.3.2 Agricultural Production

California agricultural cropping patterns vary from year to year depending upon climatic, economic, and other conditions. Table 3-5 presents average annual acres in production and production values for LBAM host crops in the primary Program Area. Over the period 2002 to 2006, an average of 702,000 acres was in host crop production in the primary Program Area, accounting for 12.4 percent of host crop acreage across the state. Most host-crop production in the primary Program Area was in vegetable and melon crops, approximately 437,000 acres. Other host crops with substantial area in production in the primary Program Area include grapes (163,000 acres), “other” crops (42,000 acres), and strawberries (17,000 acres). These top four crop groups accounted for almost 94 percent of the total agricultural host crop acreage in the primary Program Area.

Average cropping patterns and production values for LBAM host crops in California are presented in Table 3-6.

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Table 3-3 Earnings by Industry in the Program Area (2006)^{1,2,3}

County/Area	Farm / Agriculture	Natural Resources and Mining	Construction	Manufacturing	Wholesale and Retail Trade	Transportation and Warehousing	Utilities	Finance and Insurance	Other Services	Government	Total
Alameda	\$7,633,563	\$10,847,309	\$3,966,667	\$7,499,375	\$6,779,481	(D)	(D)	\$2,696,717	\$22,722,633	\$9,285,535	\$71,431,280
Contra Costa	-\$12,959	\$325,893	\$3,218,768	\$2,949,037	\$2,887,630	\$894,795	\$377,411	\$3,131,465	\$12,516,868	\$3,422,528	\$29,711,436
Marin	-\$5,683	(D)	\$829,108	\$153,173	\$1,018,230	\$76,635	\$27,345	\$1,274,884	\$5,525,740	\$971,066	\$9,870,498
Monterey	\$1,014,438	\$1,140,884	\$667,465	\$631,099	\$1,346,547	\$230,596	\$55,484	\$394,974	\$3,366,599	\$2,614,664	\$11,462,750
Napa	\$155,213	\$97,455	\$464,752	\$933,718	\$373,255	\$94,428	\$14,916	\$184,233	\$1,484,796	\$616,592	\$4,419,358
San Benito	\$87,827	(D)	\$118,818	\$159,572	\$120,773	(D)	(D)	\$22,010	\$177,551	\$181,892	\$868,443
San Francisco	\$0	\$93,492	\$1,874,052	\$927,026	\$3,707,005	(D)	(D)	\$11,179,629	\$28,969,107	\$8,399,741	\$55,150,052
San Mateo	\$42,213	\$41,237	\$1,838,334	\$4,340,234	(D)	\$2,186,735	(D)	\$3,487,112	\$17,115,625	\$2,387,429	\$31,438,919
Santa Barbara	\$346,380	\$904,322	\$1,233,300	\$1,180,974	\$171,317	\$47,730	\$609,411	\$4,713,870	\$2,397,990	\$12,012,106	\$23,617,400
Santa Clara	\$89,351	\$153,839	\$4,068,459	\$26,714,219	\$8,880,613	\$734,454	\$2,671,175	\$3,093,011	\$41,557,455	\$7,098,805	\$95,061,381
Santa Cruz	\$223,432	(D)	\$716,364	\$504,011	\$955,052	(D)	(D)	\$219,003	\$2,554,629	\$1,122,804	\$6,295,295
Solano	\$1,194	\$54,225	\$927,105	\$846,764	\$1,021,878	\$262,980	\$60,688	\$295,216	\$2,555,350	\$2,251,464	\$8,276,864
Sonoma	\$99,881	\$97,439	\$1,452,024	\$1,789,701	\$1,590,213	(D)	(D)	\$654,237	\$4,919,489	\$1,752,390	\$12,355,374
Primary Program Area Total	\$2,112,220	\$2,487,529	\$21,046,238	\$48,681,229	\$32,166,059	\$4,651,940	\$3,254,749	\$27,241,902	\$148,179,712	\$42,502,900	\$332,324,478
Percent of Primary Program Area Total	0.6%	0.7%	6.3%	14.6%	9.7%	1.4%	1.0%	8.2%	44.6%	12.8%	100.0%
Statewide Program Area Total	\$7,633,563	\$10,847,309	\$79,729,318	\$131,557,333	\$128,073,754	\$32,048,713	\$11,967,645	\$80,357,587	\$463,216,834	\$179,929,478	\$1,125,361,534
Percent of Statewide Program Area Total	0.7%	1.0%	7.1%	11.7%	11.4%	2.8%	1.1%	7.1%	41.2%	16.0%	100.0%

Source: Bureau of Economic Analysis 2006b (Table CA05N: Personal income by major source and earnings by NAICS industry)

¹Values in thousands (\$1,000) of dollars.

²(D) = Estimate not available to avoid disclosure of confidential information; estimate included in totals.

³(L) = Less than \$50,000, but estimates are included in the totals.

Table 3-4 LBAM Known-Host Commodity Groups and Descriptions

Commodity Group	List of Commodities
Nursery Stock	Unspecified
Vegetables and Melons	Artichokes, asparagus, beans, beets, broccoli, Brussels sprouts, cabbage, cantaloupe, carrots, cauliflower, celery, clover, collard greens, corn, cucumbers, eggplants, gourds, greens (turnip and mustard), honeydew, horseradish, jicama, kale, kohlrabi, lettuce, melons, parsley, parsnips, peas, peppers (bell and chili), potatoes, pumpkin, radish, rappini, rutabagas, squash, soybeans, spinach, sprouts (alfalfa and bean), sugar beets, tomatillos, tomatoes, turnips, watercress, watermelon, yams, and unspecified vegetables and melons.
Strawberries	Strawberries
Caneberries	Blackberries, blueberries, boysenberries, bushberries, cranberries, currants, loganberries, olallieberries, raspberries, and unspecified berries.
Grapes	Raisins, table grapes, wine grapes, and unspecified grapes.
Avocado	Avocados
Stone Fruits	Apricots, cherries, nectarines, peaches, plumcots, and plums.
Pome Fruits	Apples, crabapples, pears, and quince.
Citrus Fruits	Grapefruit, kumquats, lemons, limes, oranges, mandarins, tangelos, and tangerines.
Other Fruits	Figs, guava, kiwifruit, kumquats, loquat, mango, olives, persimmons, passion fruit, and unspecified fruits.
Nut Crops	Almonds, cashews, chestnuts, filberts, macadamia nuts, peanuts, pecans, pistachios, and walnuts.
Other Crops	Alfalfa

Source: CDFA, Plant Health and Pest Prevention Services 2009a

Between 2002 and 2006, an average of more than 5.6 million acres in California was in host crop production, with the majority (2.0 million acres or 32.7 percent) in vegetable and melon crops. Other prominent host crop acreage across the state included other crops (1.2 million acres), nuts (932,000 acres), and grapes (830,000 acres). These top four crop groups accounted for approximately 87 percent of the total agricultural host-crop acreage in the statewide Program Area.

Table 3-5 Average Annual Host-Crop Acreage and Value in the Primary Program Area (2002–2006)^a

Crop Group	Acres	Percent of Acres	Value ^b	Percent of Value	Value per Acre
Nursery Stock	--	--	\$958,974,618	15.4%	--
Vegetables and Melons	437,495	62.3%	\$3,095,445,023	49.7%	\$7,075
Strawberries	17,054	2.4%	\$693,307,521	11.1%	\$40,654
Caneberries	2,996	0.4%	\$141,794,584	2.3%	\$47,328
Grapes	163,072	23.2%	\$1,177,064,776	18.9%	\$7,218
Avocado	8,697	1.2%	\$41,566,837	0.7%	\$4,780
Stone Fruits	6,114	0.9%	\$16,363,938	0.3%	\$2,676
Pome Fruits	7,542	1.1%	\$21,685,186	0.3%	\$2,875
Citrus Fruits	2,961	0.4%	\$24,570,693	0.4%	\$8,298
Other Fruits	2,186	0.3%	\$9,993,087	0.2%	\$4,572
Nut Crops	12,540	1.8%	\$18,535,579	0.3%	\$1,478
Other Crops	41,756	5.9%	\$28,283,496	0.5%	\$677
Total	702,413	100.0%	\$6,227,585,338	100.0%	\$7,501

Source: California Agricultural Commissioner's Data 2002–2006

^aCrop acres and values from 2002 to 2006 were collected and normalized by excluding the maximum and minimum values and averaging the remaining values.

^bAgricultural values represent the farm gate values of cultivated products, which are the net values of the products when they leave the farm.

Table 3-6 Average Annual Host-Crop Acreage and Value in the Statewide Program Area, 2002–2006^a

Crop Group	Acres	Percent of Acres	Value ^b	Percent of Value	Value per Acre
Nursery Stock	--	--	3,834,597,154	15.4%	--
Vegetables and Melons	1,957,906	34.7%	7,629,715,633	30.7%	\$3,897
Strawberries	31,810	0.6%	1,190,342,578	4.8%	\$37,420
Caneberries	5,248	0.1%	213,530,251	0.9%	\$40,691
Grapes	830,407	14.7%	3,659,011,952	14.7%	\$4,406
Avocado	64,904	1.2%	420,334,557	1.7%	\$6,476
Stone Fruits	268,160	4.8%	1,381,597,284	5.6%	\$5,152
Pome Fruits	39,489	0.7%	227,250,381	0.9%	\$5,755
Citrus Fruits	268,555	4.8%	1,650,454,064	6.6%	\$6,146
Other Fruits	76,099	1.3%	273,559,800	1.1%	\$3,595
Nut Crops	931,953	16.5%	3,314,431,909	13.4%	\$3,556
Other Crops	1,163,597	20.6%	1,032,187,726	4.2%	\$887
Total	5,638,128	100.0%	\$24,827,013,289	100.0%	\$3,723

Source: California Agricultural Commissioners Data 2002–2006

^a Crop acres and values from 2002 to 2006 were collected and normalized by excluding the maximum and minimum values and averaging the remaining values.

^b Agricultural values represent the farm gate values of cultivated products, which are the net values of the products when they leave the farm.

3.1.3.3 Organic Farming

The organic food industry has grown at an estimated 20 percent annual rate over the last decade because of increased consumer demand and attractive organic price premiums (Oberholtzer et al. 2005). California is the largest producer of organic vegetables in the U.S., accounting for 41 percent of U.S. certified organic vegetable acreage.

Certified organic foods grown in the U.S. are produced according to standards set by the National Organic Program, and are administered by the USDA. Specifically, organic food is to be produced without using genetically modified organisms, synthetic pesticides or fertilizers, and most other conventional farming practices. Growers must manage their farmland for 3 years under allowed practices before being certified organic by the USDA. A USDA inspector visits the farm to ensure that all growing and handling practices follow the rules necessary to meet USDA organic standards.

Organic host crop acreages for the primary Program Area are displayed in Table 3-7. The largest acreage is in vegetables. Organic vegetables account for over 20,000 acres, 64.7 percent of all organic host-crop acreage in the primary Program Area. The next largest acreages are in pome fruits with 3,200 acres (10.0 percent) and grapes with 2,800 acres (8.8 percent). The smallest acreages are in citrus fruit with 117 acres (0.4 percent) and stone fruits with 291 acres (0.9 percent).

Table 3-7 Certified Organic Host-Crop Acreage and Value in the Primary Program Area, 2007

Crop Group	Acres	Percent of Acres	Value	Percent of Value	Value per Acre
Nursery Stock	--	---	8,257,553	3.6%	--
Vegetables and Melons	20,844	64.7%	149,293,901	64.3%	\$7,163
Strawberries	1,452	4.5%	40,078,822	17.3%	\$27,602
Caneberries	448	1.4%	9,275,729	4.0%	\$20,700
Grapes	2,829	8.8%	14,828,067	6.4%	\$5,241
Avocado	296	0.9%	1,069,555	0.5%	\$3,610
Stone Fruits	291	0.9%	1,795,492	0.8%	\$6,181
Pome Fruits	3,211	10.0%	3,068,104	1.3%	\$956
Citrus Fruits	117	0.4%	511,263	0.2%	\$4,381
Other Fruits	1,350	4.2%	774,416	0.3%	\$574
Nut Crops	1,366	4.2%	3,194,185	1.4%	\$2,338
Other Crops	0	0.0%	50	0.0%	--
Total	32,204	100.0%	\$232,147,136	100.0%	\$6,952

Source: California Department of Food and Agriculture 2007 (California Organic Crops, by County and Crop)

California had more than 127,000 acres in certified organic host crops in 2007 (see Table 3-8). Vegetables were the largest at 56,600 acres. Organic grapes were the second largest at 19,200 acres, and other crops were third at 12,900 acres. The smallest acreages included cranberries at 840 acres, strawberries at 1,750 acres, and avocados at 3,300 acres.

Table 3-8 Certified Organic Host-Crop Acreage and Value in the Statewide Program Area, 2007

Crop Group	Acres	Percent of Acres	Value	Percent of Value	Value per Acre
Nursery Stock	--	--	12,041,270	2.0%	--
Vegetables	56,686	44.5%	331,374,762	55.1%	\$5,846
Strawberries	1,754	1.4%	46,526,061	7.7%	\$26,530
Cranberries	842	0.7%	19,004,943	3.2%	\$22,585
Grapes	19,225	15.1%	79,210,113	13.2%	\$4,120
Avocado	3,378	2.7%	14,070,249	2.3%	\$4,166
Stone Fruits	4,926	3.9%	24,517,339	4.1%	\$4,978
Pome Fruits	4,529	3.6%	9,476,121	1.6%	\$2,093
Citrus Fruits	7,675	6.0%	29,097,094	4.8%	\$3,791
Other Fruits	4,588	3.6%	5,492,302	0.9%	\$1,197
Nut Crops	10,912	8.6%	25,004,508	4.2%	\$2,291
Other Crops	12,901	10.1%	5,639,798	0.9%	\$437
Total	127,413	100.0%	\$601,454,560	100.0%	\$4,626

Source: California Department of Food and Agriculture 2007 (California Organic Crops, by County and Crop)

3.1.3.4 Designated Farmland

California has approximately 27.5 million acres of farmland. The California Department of Conservation designates farmland based on technical soil ratings and current land use (California Department of Conservation 2008) (see Table 3-9). For this analysis, important “Farmland” covers four categories: Prime Farmland, Farmland of Statewide Importance, Unique Farmland, and Farmland of Local Importance. Of the state’s total farmland acreage, 12.4 million acres are considered important farmland.

A summary of the area designated as important farmland in the primary Program Area and the state is shown in Table 3-10. The primary Program Area has 1.1 million acres of important farmland. Prime Farmland accounts for approximately 557,000 acres, Farmland of Local Importance accounts for 272,000 acres, Unique Farmland accounts for 144,000 acres, and Farmland of State Importance accounts for 122,000 acres.

Table 3-9 California’s Farmland Designation Categories and Descriptions

Category	Description
Prime	The best combination of physical and chemical features able to sustain long-term agricultural production.
Statewide Importance	Similar to Prime but with minor shortcomings such as greater slopes or less ability to store soil moisture.
Unique	Farmland of lesser quality soils used for production of the state’s leading agricultural crops.
Local Importance	Land of importance to the local agricultural economy as determined by each county’s board of supervisors or local advisory committee.
Grazing Land	Land with existing vegetation suited for livestock grazing.
Urban and Built-up Land	Land occupied by structures used for residential, industrial, commercial, institutional, transportation yards, cemeteries, airports, golf courses, landfills, water or sewer treatment, or other developed purposes.
Other Land	Land not included in any other mapping category. Often including low-density rural developments like brush, timber, or wet lands that are not suitable for livestock. Strip mines, borrow pits, small bodies of water, and vacant and nonagricultural land surrounded on all sides by urban development.
Water	Perennial bodies of water that are 40 acres or larger.
Irrigated Farmland	Cropped land that has a developed, dependable, and adequate irrigation water supply.
Nonirrigated Farmland	Land that produces agricultural commodities on a continuing basis using stored soil moisture.

Source: California Department of Conservation 2009 (FMMP-Important Farmland Categories)

Table 3-10 Important Farmland Summary, 2004

Area	Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Important Farmland Subtotal
Alameda	5,383	1,505	2,377	0	9,265
Contra Costa	32,024	8,547	3,929	52,257	96,757
Marin	7	444	256	65,751	66,458
Monterey	169,369	44,546	26,479	0	240,394
Napa	32,446	9,792	17,811	19,279	79,328
San Benito	32,085	9,465	2,625	27,388	71,563
San Francisco	0	0	0	0	0
San Mateo	2,587	187	2,659	3,504	8,937
Santa Barbara	67,774	12,380	35,135	20,837	136,126
Santa Clara	24,717	5,630	2,396	6,005	38,748
Santa Cruz	15,181	3,268	5,399	757	24,605

Table 3-10 Important Farmland Summary, 2004

Area	Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Important Farmland Subtotal
Solano	141,575	7,286	12,012	0	160,873
Sonoma	33,803	18,624	33,300	76,384	162,111
Primary Program Area Total	556,951	121,674	144,378	272,162	1,095,165
Statewide Program Area Total*	5,076,207	2,691,258	1,275,092	2,854,727	12,441,547
Primary Program Area as Percentage of Statewide Program Area	11.0%	4.5%	11.3%	9.5%	8.8%

Source: California Department of Conservation, Division of Land Resource Protection 2006a (California Farmland Conversion Report, 2002-2004)

* Important farmland subtotal for the state includes two additional values: 536,802 acres of irrigated farmland and 7,461 of nonirrigated farmland.

3.1.3.5 Williamson Act and Agricultural Zoning

The California Land Conservation Act (the Williamson Act) was enacted in 1965 to preserve agricultural and open-space lands from premature and unnecessary urbanization and development. Landowners can voluntarily enter into the restrictive 10-year contracts by placing their land within an agricultural preserve (land designated by the city or county for Williamson Act contracts that must be a minimum of 100 acres in size, but does not need to be owned by the same person). In return, property taxes are assessed upon generated income instead of the property’s potential market value. Tax savings under the Williamson Act have been estimated to be 20 to 75 percent (California Department of Conservation 1989). The contract automatically renews each year thereafter unless a “nonrenewal” application is filed and it remains in place even if the land changes ownership. As of January 2005, 16 million acres of California’s farmland in 54 of 58 counties (except Del Norte, San Francisco, Inyo, and Yuba counties) were enrolled in the Williamson Act.

The Farmland Security Zone (FSZ) was added to the Williamson Act to enhance its conservation potential. To qualify as FSZ, land must be also part of an agricultural preserve, but must contract for a longer, 20-year term. In return landowners receive a greater tax reduction, 65 percent of the Williamson Act’s valuation of 20 to 75 percent of fair market value. As of January 2005, 25 counties had adopted the FSZ and 21 of those counties reported over 818,000 acres designated as FSZ, amounting to 5 percent of statewide Williamson Act totals (California Department of Conservation 2006b).

Agricultural conservation acreage in the primary Program Area totals 3.1 million acres, as shown in Table 3-11. Monterey County has the largest acreage at 764,000 acres, followed by San Benito with 584,000 acres, and Santa Barbara with 548,000 acres. The least acres are in San Francisco at 0 acre, Santa Cruz County at 19,000 acres, and San Mateo County at 47,000 acres.

Table 3-11 Agricultural Conservation Acreage in the Program Area, 2003

County	Williamson Act Acres	Farmland Security Zone Acres	Total*
Alameda	134,332	–	134,332
Contra Costa	48,699	–	48,699
Marin	85,427	16,039	101,466
Monterey	735,136	29,177	764,313
Napa	68,598	–	68,598
San Benito	584,331	–	584,331
San Francisco	–	–	–

Table 3-11 Agricultural Conservation Acreage in the Program Area, 2003

County	Williamson Act Acres	Farmland Security Zone Acres	Total*
San Mateo	47,058	-	47,058
Santa Barbara	548,762	133	548,895
Santa Clara	330,769	-	330,769
Santa Cruz	19,350	123	19,474
Solano	258,999	-	258,999
Sonoma	285,396	-	285,396
Primary Program Area Total	3,146,858	45,472	3,192,330
Statewide Program Area Total	15,738,112	822,677	16,560,789

Source: California Department of Conservation 2008 (Williamson Act Program- Report and Statistics, by County)
* Total Conservation acreage equals the sum of Williamson Act acres and Farmland Security Zone acres.

3.1.3.6 Beneficial Insects and Agriculture

A range of insects provide agricultural benefits in the form of crop pollination, and many flowers also require pollination. Honeybee pollination is reported to be essential for more than 90 food crops (Agricultural Research Service 2009). Data on agricultural crop value attributable solely to insect pollination are limited. However, research has been conducted that measures the economic value of honeybee pollination based on crop dependence on pollination and production values for various crops, many of which are grown in California and are LBAM hosts (Morse and Calderone 2000). This research shows that the economic value attributable to honeybees was \$14.6 billion across the U.S. in 2000. The crops that account for the largest proportion of the U.S. total are alfalfa hay, apples, almonds, cotton, and soybeans.

For this study, the conceptual framework presented in the research conducted by Morse and Calderon was applied to LBAM host crops and production values in the Program Area. Based on this approach, the economic value attributed to honeybee pollination in the primary and statewide Program Areas is estimated to be approximately \$576.2 million and \$7.4 billion, respectively, per year

3.1.4 Agricultural and Horticultural Economics

This section focuses on economic parameters that could be affected by ongoing LBAM infestation in California. These parameters are agricultural and horticultural revenues, including organic crop revenues; agricultural exports and trade; and regional economic benefits from existing agricultural and horticultural production of crops susceptible to LBAM infestation.

Agriculture is an essential part of the California economy. It provides crops for final consumption in California and other domestic and international markets, and also generates jobs and income for thousands of workers in the farm sector, as well as agricultural-support industries. Farm production has important linkages to many industries, such as equipment and chemical manufacturing, food and beverage processing, financial services, textiles, and transportation. In 2003, agriculture, forestry, fishing, hunting, and supporting industries accounted for about 1.5 percent of the state’s gross state product of \$1.43 trillion (Agricultural Issues Center, University of California 2006).

Similarly, the California nursery industry plays an important role in California’s economy and is the largest in the world. In 2001, this industry was the second largest subsector of agricultural production and had approximately \$3.0 billion in sales, contributed more than \$8 billion in total output, and directly and

indirectly supported over 81,000 jobs (Carman and Rodriguez 2004). Californians are the primary consumers of nursery products and are the largest single market for lawn and garden products in the U.S.

3.1.4.1 Agricultural Revenues and Production Values

The value of agricultural and horticultural products produced in the primary Program Area and throughout California is substantial. The agricultural revenues (or farmgate values) of those commodities potentially affected by LBAM, including organic crops, is outlined in Table 3-5 and Table 3-6 and described in Section 3.1.3.2, Agricultural Production. Table 3-7 and Table 3-8 focus specifically on organic crop values, which are described, along with the associated price premium associated with organically produced commodities, in Section 3.1.3.3, Organic Farming.

Host Crops

The average annual value of host crops produced in the primary Program Area is approximately \$6.2 billion, which accounts for 25.1 percent of total host crop value produced in California. The highest-value host crop group in the primary Program Area is vegetable and melon crops, with an annual value of \$3.1 billion. Other high-value host crops in the primary Program Area are grapes, with a value of \$1.2 billion annually, nursery stock, with an annual value of \$958.9 million, and strawberries valued at \$693.3 million annually. These top 4 crop groups account for 95.1 percent (\$5.9 billion) of the total annual agricultural host crop value in the primary Program Area.

In the statewide Program Area, the annual value of host crop production is approximately \$24.8 billion. Vegetables and melons are the highest value at about \$7.6 billion annually, which accounts for roughly 30.7 percent of the total host crop value across the state. Annual values of host crops in California include nursery stock with \$3.8 billion, grapes at \$3.7 billion, and nut crops at \$3.3 billion. These top four crop groups account for 74.3 percent of the total agricultural host crop value in the statewide Program Area.

Organic Host Crops and Price Premiums

Agricultural revenues from organic host crops in the primary Program Area is approximately \$232.1 million annually. Organic vegetable crops generate about \$149.2 million annually, which represents 64.7 percent of the total value of organic host crop production. Organic strawberries, with an annual value of \$40.0 million annually (17.3 percent of the total), and organic grapes, valued at \$14.8 million annually (6.4 percent), are other important organic crops in the primary Program Area.

At the state level, the highest-valued organic commodities are also vegetable crops, with an annual value of over \$331 million, or 55.1 percent of total organic host-crop value. Organic grapes are the next highest at \$79.2 million annually (13.2 percent of total production value), followed by organic strawberries at \$46.5 million annually (7.7 percent).

Certified organic produce generally receives a price premium that reflects higher costs for additional processing, transportation, and handling requirements. Comprehensive price data for organic products are not available. However, several studies have analyzed available farm-level, wholesale, and retail organic prices, showing significant premiums for organic fruits, vegetables, grains, and milk (Oberholtzer et al. 2005). In addition, the USDA has collected data on wholesale organic price premiums for several fruits and vegetables. It found that organic prices were significantly higher than conventional prices for several crops (Economic Research Service 2008). For example, from 1999 to 2007, organic broccoli sold for 44.1 percent more than nonorganic broccoli. Premiums for organic carrots and organic salad mix were 35.3 and 10.0 percent higher than their respective nonorganic counterparts. From 2005 through 2007, fruits overall received a price premium of 54.4 percent and vegetables 77.1 percent.

3.1.4.2 Agricultural and Nursery Product Exports

California is the top exporter in the nation for fruits, tree nuts, and many other specialty crops (CDFA, Plant Health and Pest Prevention Services 2009b). In 2006, exports of California agricultural and nursery products were valued at \$9.8 billion, a record to that date (Rowhani and Sumner 2007). The top 10 commodities accounted for 60 percent of the total, and the top 55 accounted for 86 percent. The top 10 commodities are relatively consistent from year to year, although the rankings within the group change occasionally. Almonds have been the highest-value export since 2004. Wine, cotton, table grapes, dairy and dairy products, processed tomatoes, and walnuts and pistachios have consistently been within the top 10 since that time.

Export markets are critical outlets for many California agricultural products. In 2006, 96 percent of California cotton production, 72 percent of almonds, and 57 percent of pistachios were exported. Grape exports, including wines, accounted for 27 percent of California production. The access to export markets for many California crops supports the prices of those commodities.

California agricultural products were exported to more than 150 individual countries in 2006 (Rowhani and Sumner 2007). The top 10 destinations accounted for 72 percent of total export value. The largest export markets have consistently been the European Union (of 25 or 27 countries, depending upon year), Canada, Japan, China/Hong Kong, Mexico, and South Korea. In 2006, the European Union (25 countries) accounted for 25 percent of total exports, Canada accounted for 23 percent, Japan for 10 percent, China/Hong Kong and Mexico each for 7 percent, South Korea for 4 percent, and the rest of the world 23 percent.

Table 3-12 contains estimates of the export values of host crops from counties in the primary Program Area. Because county-level data on agricultural exports are not available, the figures shown are based on statewide percentages, which are then applied to average values of exported crops grown in the 13-county area between 2002 and 2006.² The largest export crop value was grapes at \$442.7 million. That figure is based on the product of the 5-year crop value for grapes, \$1,177.1 million, and the statewide average of 37.6 percent of the value of the crop that is exported. The next largest crop groups in value were vegetables and melons and strawberries. On average, 17.4 percent of the total value of host crops in the primary Program Area was exported from 2002 through 2006 at an average value of nearly \$1.1 billion.

Table 3-12 Average Annual Agricultural Export Values of Host Crops in the Primary Program Area (2002–2006)

Crop Group	Total Host Crop Value	Percent of Crops Exported	Total Export Crop Value
Nursery Stock	\$958,974,618	1.1%	\$10,769,961
Vegetables and Melons	\$3,095,445,023	13.6%	\$421,187,223
Strawberries	\$693,307,521	19.1%	\$132,215,747
Caneberries	\$141,794,584	11.4%	\$16,133,273
Grapes	\$1,177,064,776	37.6%	\$442,669,844
Avocado	\$41,566,837	0.6%	\$228,849
Stone Fruits	\$16,363,938	29.1%	\$4,769,238
Pome Fruits	\$21,685,186	21.8%	\$4,720,910
Citrus Fruits	\$24,570,693	31.8%	\$7,818,771
Other Fruits	\$9,993,087	13.3%	\$1,332,363
Nut Crops	\$18,535,579	60.9%	\$11,296,937
Other Crops	\$28,283,496	11.4%	\$3,217,486
Total	\$6,227,585,338	17.0%	\$1,056,360,602

Source: Agricultural Issues Center, University of California. Various years. California International Agricultural Exports.

² This approach assumes that the percentage of crops exported from counties in the 13-county area is equal to the average for the entire state.

Corresponding figures for California are displayed in Table 3-13. The host crops with greatest export values were nut crops at \$2.0 billion, grapes at \$1.4 billion, and vegetable and melons at \$1.0 billion. On average, approximately 23.6 percent of total host crops were exported from the state at an annual value of over \$5.8 billion.

Table 3-13 Annual Average Agricultural Export Values of Host Crops in the Statewide Program Area (2002–2006)

Crop Group	Total Value	Percent of Exports	Export Value
Nursery Stock	\$3,835,343,218	1.1%	\$43,065,228
Vegetables and Melons	\$7,096,811,796	13.6%	\$969,648,587
Strawberries	\$1,190,342,578	19.1%	\$227,001,768
Caneberries	\$213,530,251	11.4%	\$24,295,300
Grapes	\$3,659,011,952	37.6%	\$1,376,079,111
Avocado	\$420,334,557	0.6%	\$2,314,178
Stone Fruits	\$1,381,597,284	29.1%	\$402,663,822
Pome Fruits	\$227,250,381	21.8%	\$49,472,885
Citrus Fruits	\$1,650,454,064	31.8%	\$525,199,768
Other Fruits	\$606,099,042	13.3%	\$80,012,526
Nut Crops	\$3,336,392,760	60.9%	\$2,020,057,109
Other Crops	\$1,032,187,726	11.4%	\$117,420,066
Total	\$24,649,355,609	23.6%	\$5,837,230,348

Source: Agricultural Issues Center, University of California. Various years. California International Agricultural Exports.

3.1.4.3 Regional Economic Contribution of Existing Agriculture (Host Crops)

As previously stated, the role of agriculture in local economies throughout the state and the statewide economy extends beyond the farm-level direct benefits. Any change in agricultural production sets in motion a series of “ripple effects,” which collectively cause changes in output (economic production), employment, and income throughout the economy. The effects are frequently quantified by the use of input-output models, discussed in greater detail in Appendix B, and account for the indirect and induced effects attributable to the farm-level direct effects. Table 3-14 presents the regional economic impacts of current agricultural production of LBAM host crops in the primary and statewide Program Areas.

Table 3-14 Economic Importance of Existing Agricultural Production (LBAM Hosts)^{1,2}

Area	Annual Output (\$ Million)		Annual Labor Income (\$ Million)		Employment (Jobs)	
	Direct	Total	Direct	Total	Direct	Total
Primary Program Area	\$6,443	\$10,207	\$2,685	\$4,032	57,054	84,165
State of California	\$25,710	\$43,340	\$9,225	\$15,221	185,092	320,409

Source: ENTRIX 2009
¹Based on agricultural production of LBAM host crops during the period 2002 to 2006
²Values reported in thousands 2009 dollars

In the primary Program Area, the direct output (or value) of existing host crop production is estimated to be \$6.4 billion annually. This level of agricultural production indirectly generates an additional \$3.8 billion in output value annually for a total of over \$10.2 billion in the 13-county area. The direct labor income attributed

to existing host crop production is nearly \$2.7 billion annually, and over \$4.0 billion in total. The direct and total employment effects of existing agricultural host production in the primary Program Area are approximately 57,100 and 84,200 jobs, respectively.

The regional economic effects attributable to host crop production throughout the state are even more substantial. Host crop production in the statewide Program Area annually supports approximately \$25.7 billion and \$43.3 billion in direct and total output, \$9.2 billion and \$15.2 billion in direct and total labor income, and 185,100 and 320,400 direct and total jobs, respectively.

3.1.5 Regulatory Environment

When LBAM was discovered in California in 2007, an emergency was declared that placed all counties with LBAM detection under quarantine (APHIS 2007a). The state-mandated quarantine places tight restrictions on the interstate movement of nursery stock or greenery of any plants, trees, or bushes (includes all green waste and green hay) located within the 13 quarantined counties (also applies to any farm or facility within 1.5 miles of a LBAM detection site). The quarantine does allow for the movement of the host crop items so long as specific control measures are followed. Eligibility for shipment from within the quarantined areas requires trapping for LBAM on each premise or farm³ that ships any regulated articles interstate, and traps must be inspected by an inspector biweekly.

All nurseries and cut flower farms must implement an Integrated Pest Management program that consists of regular inspection and approved treatments designed to target LBAM. Items intended for interstate movement must be inspected by an inspector, and a certificate⁴ approving for interstate movement can be issued only if the articles are found free of any life stages of LBAM. Farms that are larger than 5 acres must maintain 1 trap for every 5 acres or less and the farms that are 5 acres or less must have at least 1 trap. An inspector must inspect traps biweekly to ensure freedom from LBAM.

Each establishment or facility must have one visual inspection by an inspector to verify freedom from any LBAM life stages, including eggs, larvae, and pupae. Each establishment that is inspected and found free of LBAM must be included in a master list of certified LBAM-free facilities maintained by the CDFA.

Shipment of fruits, vegetables, and bulk fresh herbs and spices from the quarantined counties requires trapping for LBAM at an approved detection level, and traps must be inspected by an inspector biweekly. Crops and fields must be inspected at the shipping location 30 days prior to shipping.

3.2 ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

This section describes the physical and economic impacts of the Program alternatives on agricultural and horticultural resources. The analysis addresses both direct and indirect impacts, organized by Program alternative. Cumulative impacts are discussed subsequent to the analysis of Program alternatives. The section concludes with a summary of environmental impacts and mitigation commitments by the CDFA, where applicable.

³ Premises or farms that are larger than 5 acres must maintain traps at a density of 1 trap every 5 acres or less. Premises or farms that are equal to or less than 5 acres must be trapped with a minimum of 1 trap.

⁴ A document, stamp, or imprint by which an inspector affirms that a specified regulated article meets applicable requirements of this subpart and may be moved interstate to a destination.

3.2.1 Evaluation Concerns and Criteria

CEQA Guidelines state that economic or social information may be included in an EIR (Section 15131). However, such effects should not be treated as significant impacts on the environment, although an EIR may trace the chain of cause and effect from economic to environmental impacts focusing on the resultant physical change in the environment (Section 15131(a)). In the context of the Proposed Program, the economic impacts of allowing LBAM to establish in California, including increased farm-level production costs and decreased revenues, could result in agricultural land being taken out of production. In addition, economic impacts can be used to determine significance of environmental impacts [Section 15131(b)].

For this analysis, the following criteria are used to determine the significance of impacts on agricultural resources. Would the Program:

- Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance?
- Conflict with existing zoning for agricultural use, or a Williamson Act contract?
- Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to nonagricultural use?

Under CEQA, determining the significance of economic impacts is not required, and accordingly, no criteria are established for assessing the significance of economic impacts. Therefore, professional judgment was used to evaluate economic impacts for this study.

3.2.2 Evaluation Methods and Assumptions

The methodology used to analyze potential impacts on agricultural and horticultural resources varies by impact topic and alternative. The analysis of the No Program Alternative relies on assumptions regarding the spread of infestation and the related physical effects on crops and farm-level management actions that are expected in lieu of the Proposed Program. Under the No Program Alternative, it is assumed that the farmers and nursery operators would continue use of pesticides to avoid substantial agricultural and horticultural crop damages and to meet quarantine restrictions such that their commodities could be exported from the state. Estimates of increased pesticide application have been developed by the CDFA (see Dowell 2008a) and serve as part of the basis for changes in agricultural production costs. Further, it is assumed that individual farm-level and nursery-level responses to potential LBAM infestation would not eradicate the pest. As a result, LBAM would continue to spread statewide and some level of residual crop damage would occur. Conversely, it is assumed that implementation of the Proposed Program would completely eradicate the moth from currently infested areas and, therefore, would prevent the moth from spreading to other parts of the state. It is acknowledged that complete eradication would not occur instantly; however, this analysis does not consider the temporal nature of impacts that may occur prior to complete LBAM eradication.

3.2.2.1 Direct Effects on Agricultural Production and Revenues

This impact considers the direct effects on agricultural production and revenues resulting from crop damage due explicitly to the moth. Because the Proposed Program is assumed to successfully eradicate the moth, this impact is limited to the No Program Alternative. The approach used here is to identify host crops that could be damaged by the moth, quantify the farm-gate values of these crops, forecast the extent of damage that the moth could cause to agricultural production, and estimate the change in agricultural revenues. Forecasting the extent of physical impacts on agriculture is based in part on information provided by the program team and agricultural experts in the study area, as well as experiences in other regions affected by the moth and other invasive species. Estimation of this impact also considers farm-level management responses to LBAM infestations, including increased pesticide use.

3.2.2.2 Effects on Agricultural Trade and Exports

LBAM is a distinct threat to the export of California crops within California and to other countries and other states within the U.S. Since the first discovery of the pest in California in 2007, both federal and state quarantines have been imposed in the primary Program Area. In May 2007, the USDA implemented a federal order regulating interstate and intrastate movements of LBAM host material originating within both the regulated areas of California and the entire state of Hawaii (APHIS 2007b). The most recent quarantine manual issued by the CDFA in March 2009 establishes quarantine areas within counties in which LBAM has been discovered, prohibiting the movement of covered articles and commodities within or from the quarantined areas (CDFA 2009). The federal and state quarantines include criteria that must be met for the shipment of agricultural and nursery products from the specific region. If the criteria are met (e.g., no discovered larvae in two inspections following treatment for LBAM), movements are allowed.

Nursery stocks and products are of particular concern because many nursery plants are known hosts and are exported to many other foreign and domestic markets. Nurseries are under close scrutiny for LBAM transfer because the pest is most likely to spread in nursery plants or nursery stock rather than by flying. Nurseries are highly impacted by the federal and state quarantines, both of which include zero tolerance for LBAM. Under these programs, if LBAM larvae are discovered on nursery products, the products cannot be moved until inspections following treatment reveal no further larvae. Treatment and inspections may require 3 or more weeks (Roach, pers. comm., 2009a).

In addition to domestic intrastate and interstate quarantines, farmers and nursery operators in infested areas are subject to import restrictions of foreign importers. They include major trading partners Mexico and Canada, which have imposed strict measures on imports of crops from areas in which LBAM infestations have been discovered (Canadian Food Inspection Agency 2008; CDFA 2008c). In addition, China and South Korea have inquired about the LBAM Program (APHIS and CDFA 2009).

Consequently, continued infestation and spread of LBAM could result in the loss of access to both domestic and international markets because of state, federal, and foreign quarantines. For this impact, existing quarantine restrictions in currently infested areas were reviewed to determine the extent of current trade restrictions. This impact is limited to the No Program Alternative.

3.2.2.3 Effects on Farm-Level Production Costs

Financial impacts to farmers and nursery operators are tied directly to production costs and sales of agricultural products. This impact focuses on potential changes in production costs, and therefore net profits, assuming the moth is not eradicated under the No Program Alternative. Changes in production costs are tied to increased pesticide application by individual farmers if the Proposed Program is not implemented under the No Program Alternative. To estimate these costs, the potential extent of increased farm-level pesticide application was considered, in conjunction with the types and costs of pesticides that would likely be used.

3.2.2.4 Effects on Organic Farming

Organic farms may be affected by measures used to control LBAM infestations either under the Program or farm-level pesticide application. Depending on the chemicals or compounds applied, organic farms may lose their certification and, hence, the ability to label crops as organic and command the typical premium farm prices received for such products. Organic farmers may therefore compete directly with many other farms at lower prices than realized for organically produced crops. This effect, by necessity, was evaluated qualitatively.

3.2.2.5 Effects on Beneficial Insects and Agriculture

Control of LBAM, either through treatment under the Proposed Program or farm-level pesticide application under the No Program Alternative, may have impacts on such insects as bees, which are important for pollination of many crops. This section utilizes information on the physical effects on such beneficial insects from Chapter 12, Ecological Health, to assess the potential impacts on crop production of LBAM control. As noted previously, the impacts are primarily qualitative rather than quantitative because of data limitations.

3.2.2.6 Regional Economic Effects on Agricultural Support Industries

As California agriculture has evolved to land-intensive production and high-value crops, the linkages between industries both selling to and buying from agriculture have grown dramatically. Suppliers of agricultural inputs include seed, farm machinery, and pesticide and chemical dealers; banks; water agencies; and transport firms. Another set of industries is affected once crops are harvested, including packing operations, food processors, brokers, and truck and rail transport. California agriculture also uses large numbers of farm workers who depend for their employment on the growth, harvesting, and handling of both annual and permanent crops. This impact considers the regional economic effects of changes in agricultural production and pesticide application expected to occur under the various alternatives. To estimate these effects, a set of regional economic impact models was developed, which cover both the primary and statewide Program Areas. These models were developed using IMPLAN, a widely used set of software and data that utilizes input-output framework to measure the additional economic activity generated by initial shocks within an economy. The key parameters estimated by IMPLAN include economic output, income, and employment.

3.2.3 No Program Alternative

3.2.3.1 Effects on Agricultural Production and Land Uses

LBAM affects many agricultural host crops by feeding on the leaves, fruit, and stems, causing both internal and external fruit damage. On nursery crops, LBAM can damage foliage resulting in the loss of commercial value, particularly on ornamentals (State of Victoria, Department of Primary Industries, Pests, and Diseases 2009). Economic impacts attributed to crop damage and related losses in agricultural revenues under the No Program Alternative are addressed in Section 3.2.3.2. In addition, LBAM infestation may affect the ability of producers to ship their commodities based on quarantine restrictions, which is addressed in Section 3.2.3.3. Producers are expected to incur higher production costs associated with increased pesticide use, presented in Section 3.2.3.4.

Each of the economic factors referenced above, individually and collectively, has the potential to affect agricultural production directly and land uses indirectly in both the primary and statewide Program Areas. Although it is speculative to forecast producer behavior in the face of economic constraints, it is plausible that some producers would elect to reduce the number of acres in agricultural and horticultural production or even cease farming altogether. In these cases, agricultural land, including Designated Farmland (i.e., Prime Farmland, Unique Farmland, or Farmland of Statewide Importance) may be converted to a nonagricultural use, including urban development. Such nonagricultural uses also have the potential to conflict with existing agricultural zoning or provisions in Williamson Act contracts.

Under the No Program Alternative, the potential exists that production on agricultural land would decrease relative to existing conditions (direct impact) due to economic constraints associated with ongoing LBAM infestation in the primary Program Area and possible spread of LBAM to other parts of the state. As a result, agricultural land may be converted to nonagricultural uses if agricultural operations are no longer economically viable, an indirect impact. The conversion of agricultural land to nonagricultural uses may occur on Designated Farmland (indirect impact) and these nonagricultural uses could conflict with

agricultural zoning or Williamson Act contracts. **This decline in production on agricultural land and resulting land conversion is a potentially significant impact.**

3.2.3.2 Effects on Agricultural Revenues (Crop Damages)

The No Program Alternative assumes no LBAM Eradication Program and that existing LBAM control measures implemented by individual producers would continue. Based on the continued presence of LBAM in the primary Program Area and proliferation to other parts of the state, it is anticipated that LBAM would ultimately cause direct damages to host crops; no direct crop damages have been experienced to date in areas subject to existing infestation (Roach, pers. comm., 2009b).

The level of potential host crop damage attributed to LBAM is difficult to ascertain. Several studies have been published on crop damages in Australia and New Zealand; however, no published studies of crop damages resulting from LBAM in California or in the U.S. are known. Because of limited area-specific data, this analysis uses crop damage estimates obtained from a USDA study, which bases estimates of crop damages on LBAM infestations in Australia (APHIS 2007b) for grapes, oranges, apples, and pears, applied to the annual value of similar crops in the U.S. This analysis uses a similar approach applying the range of overall damage coefficients from the four crops considered in the USDA study to *all* known host crops in the primary and statewide Program Areas. Based on the USDA analysis, it is estimated that crop damages to host crops would range from 0.2 to 2.5 percent of total annual production values.

Estimated ranges in potential damages to LBAM host crops within the primary Program Area are shown in Table 3-15. If the Proposed Program is not implemented, it is estimated that direct crop damage to LBAM host commodities in the primary Program Area could range from \$12.5 million to \$155.7 million annually. The greatest level of host crop damage is expected on vegetables and melon crops, ranging from \$6.2 million to \$77.4 million annually, followed by grapes (\$2.4-\$29.4 million annually), and nursery stock (\$1.9 to \$24.0 million annually). Estimated crop damages translate directly into declines in agricultural revenues realized by farm operators.

Table 3-15 Average Annual Crop Damages in the Primary Program Area

Crop Group	Annual Production Value	Crop Damage: Low	Crop Damage: High
Nursery Stock	\$958,974,618	\$1,917,949	\$23,974,365
Vegetables and Melons	\$3,095,445,023	\$6,190,890	\$77,386,126
Strawberries	\$693,307,521	\$1,386,615	\$17,332,688
Caneberries	\$141,794,584	\$283,589	\$3,544,865
Grapes	\$1,177,064,776	\$2,354,130	\$29,426,619
Avocado	\$41,566,837	\$83,134	\$1,039,171
Stone Fruits	\$16,363,938	\$32,728	\$409,098
Pome Fruits	\$21,685,186	\$43,370	\$542,130
Citrus Fruits	\$24,570,693	\$49,141	\$614,267
Other Fruits	\$9,993,087	\$19,986	\$249,827
Nut Crops	\$18,535,579	\$37,071	\$463,389
Other Crops	\$28,283,496	\$56,567	\$707,087
Total	\$6,227,585,338	\$12,455,171	\$155,689,633

Crop damage estimates within the statewide Program Area are shown in Table 3-16. Across the state, potential crop damages range from \$49.7 million to \$620.8 million annually. Losses are highest for vegetables and melons, varying from \$15.3 million to \$190.7 million annually. Other crops that would experience high damages are nursery stock (\$7.7-\$95.9 million) and grapes (\$7.3-\$91.5 million annually).

Table 3-16 Average Annual Crop Damages in the Statewide Program Area

Crop Group	Annual Production Value	Crop Damage: Low	Crop Damage: High
Nursery Stock	\$3,834,597,154	\$7,669,194	\$95,864,929
Vegetables and Melons	\$7,629,715,633	\$15,259,431	\$190,742,891
Strawberries	\$1,190,342,578	\$2,380,685	\$29,758,564
Caneberries	\$213,530,251	\$427,061	\$5,338,256
Grapes	\$3,659,011,952	\$7,318,024	\$91,475,299
Avocado	\$420,334,557	\$840,669	\$10,508,364
Stone Fruits	\$1,381,597,284	\$2,763,195	\$34,539,932
Pome Fruits	\$227,250,381	\$454,501	\$5,681,260
Citrus Fruits	\$1,650,454,064	\$3,300,908	\$41,261,352
Other Fruits	\$273,559,800	\$547,120	\$6,838,995
Nut Crops	\$3,314,431,909	\$6,628,864	\$82,860,798
Other Crops	\$1,032,187,726	\$2,064,375	\$25,804,693
Total	\$24,827,013,289	\$49,654,027	\$620,675,332

Under the No Program Alternative, the continued presence of LBAM in the primary Program Area and potential spread throughout the state are expected to result in crop damages to LBAM host commodities. **Because no crop damages have been experienced to date, all potential crop damages would be reflective of the No Program Alternative; this impact is potentially significant.**

3.2.3.3 Effects on Agricultural and Horticultural Trade and Exports

The agricultural and horticultural industries in California ship many different commodities to both domestic and international markets. For LBAM host commodities, approximately 17.0 and 23.6 percent of the total crop value produced in the primary and statewide Program Areas, respectively, are exported to other markets. Under the No Program Alternative, LBAM is assumed to spread throughout all areas of the state that could support the species. As a result, farmers and nursery operators throughout the state would assume responsibility for LBAM treatment prior to export of products to meet both domestic and foreign quarantine requirements. By doing so, farmers and nursery operators would likely be able to sell their products in the venues they have traditionally used, although at higher costs and with some temporal variation to account for the time for treatment and subsequent inspections. In extreme cases, however, some international markets may not allow imports of agricultural commodities from areas with LBAM infestations even with treatment and inspection. In these cases where export markets are closed to California farmers and nursery operators regardless of LBAM treatment, the products that would normally be sold in those markets would be shifted to other markets, both domestic or foreign. As a result, the volume and value of agricultural exports are not expected to change in the primary and statewide Program Areas relative to existing conditions. As an ancillary effect, downward pressure on export prices would occur due to an increase in supply in new markets, and conversely, an upward pressure due to increase in production costs; however, neither the markets nor the prices at which the products would sell can be determined.

Under the No Program Alternative, the continued presence of LBAM in the primary Program Area would not have an impact on the volume of exports relative to existing conditions where quarantine regulations already exist. It is assumed that producers would meet treatment and inspection requirements to ship their commodities. In other areas in California, the establishment of LBAM would require quarantines in new areas with comparable restrictions to existing quarantines. **Because the volume of exports would not change in either the primary or statewide Program Areas, no impact would occur.**

3.2.3.4 Effects on Farm-Level Production Costs

Under the No Program Alternative, the state would not undertake an LBAM Eradication Program, and control of the pest would be the responsibility of individual affected farmers and nursery operators. The primary impact on farm-level production costs under this alternative would be for the pesticides that farmers and nursery operators purchase to control LBAM.

Dowell (2008a) estimates the increased pesticide usage attributable to LBAM for several California crops and crop groups – grapes, citrus, pome fruit, stone fruit, kiwi, caneberries, strawberries, almonds, and avocado. For each, Dowell tabulates the acreage in “coastal” and “noncoastal” counties and estimates the acreage that will be treated by multiplying the acreage by an assumed 5 percent of the coastal and 2.5 percent of the noncoastal acres. The resultant acres are then multiplied by pounds of active ingredient per unit of pesticide to calculate the increased number of pounds of each active ingredient that will be applied because of LBAM. The analysis does not include estimated pesticide usage on other host crops, in particular annual vegetables, permanent vegetables (e.g., artichokes and asparagus), nuts, or horticultural commodities. This analysis utilizes the low and high pesticide application rates presented in the Dowell paper.

The acreage of host crops subject to pesticide application to control LBAM are based on data presented in Dowell (2008a), summaries of county agricultural commissioner reports, and an independent estimate of nursery acreage. Total host crop area in the primary Program Area is estimated at 736,369 acres, host crop area outside of the primary Program Area is estimated at 4,986,382 acres, and total statewide host crop area is estimated at 5,759,631 acres.

Dowell (2008a) includes ranges of pesticide application rates for each crop or crop group analyzed. Pesticide costs and application rates used in this analysis are summarized in Appendix B. The range in annual pesticide application costs throughout California under the No Program Alternative is shown in Table 3-17. These estimates are based on the numbers shown in Table 3-20 and the assumption, following Dowell (2008a), that 5 and 2.5 percent, respectively, of the coastal and noncoastal host crop land would be treated with pesticides for the control of LBAM. The only exception is nurseries, for which it is assumed all acreage will be treated. For each crop or crop type, the cost shown is that for the pesticide with the maximum treatment cost per acre.

As shown in Table 3-17, the increased annual pesticides used throughout the statewide Program Area are estimated to cost between \$5.4 million and \$19.5 million annually. Crops with the largest expected incremental costs would include nuts and similar commodities at \$1.2 million to \$4.8 million, tomatoes and similar commodities at \$4.1 million, nurseries at \$1.9 million, and almonds at \$1.5 million to \$1.6 million.

Table 3-17 Total Annual Pesticide Costs for LBAM Treatment, by Crop, Under the No Program Alternative

Crop or Crop Group	Pesticide Costs by Rate Level	
	Low	High
Grapes	\$456,721	\$799,127
Citrus	\$189,852	\$474,630
Pome fruit	\$70,424	\$105,636
Stone fruit	\$374,996	\$548,240
Kiwi fruit	\$1,710	\$2,835
Caneberries	\$15,667	\$23,501
Strawberries	\$120,096	\$180,144
Almonds	\$1,532,934	\$1,647,178
Avocado	\$22,852	\$91,409
Artichoke	\$20,148	\$40,295
Asparagus	\$9,633	\$9,633
Beans	\$20,324	\$40,648
Broccoli/similar	\$188,189	\$376,377
Carrots/similar	\$195,141	\$390,281
Corn	\$433,724	\$433,724
Fruits, nuts unspecified	\$17,038	\$40,890
Alfalfa	\$188,062	\$188,062
Mint	\$1,433	\$1,433
Lettuce/similar	\$491,440	\$982,880
Peas	\$69,100	\$69,100
Potatoes	\$477,940	\$477,940
Spinach/similar	\$121,795	\$121,795
Cucurbits	\$90,072	\$180,144
Tomatoes/similar	\$4,118,847	\$4,118,847
Nuts/similar	\$1,194,672	\$4,778,688
Nurseries	\$1,935,595	\$1,935,595
Total	\$5,394,328	\$19,453,553

Control of LBAM by individual farmers and nursery operators could result in increased annual production costs ranging from \$5.4 million to \$19.5 million. These amounts would represent increased costs of production for farmers and nursery operators. In some cases, the costs may be substantive enough to force those businesses to reduce production. The potential for such adverse effects is greater than under existing conditions. **This potential for increased costs to result in reduced production is a potentially significant impact.**

3.2.3.5 Effects on Organic Farming

If LBAM is not treated, organic farmers may suffer crop damages and losses, which are summarized in the analysis of agricultural revenues and crop damages presented in Section 3.2.3.2. Under the No Program Alternative, organic farmers are expected to take measures to protect crops from pest damage and reduce quarantine effects. Several such measures comply with the USDA's National Organic Program Standards including ground applications of pheromones, application of the pesticides spinosad and *Bacillus thuringiensis kurstaki* (Btk), biological controls in the form of *Trichogramma* wasps, and spraying of horticulture oils. Using these treatment options would allow organic growers to retain their organic certification and no impact would occur relative to existing conditions.

However, under the No Program Alternative, other conventional growers as well as households are expected to increase pesticide use in an effort to control LBAM and meet quarantine restrictions, which would increase the potential for pesticide drift onto organic farms. The USDA National Organic Program Standards require organic farms to have clearly defined buffers and boundaries between organic and nonorganic farms to address drift issues. Despite these measures, if drift were to occur, the contaminated organic crops could not be sold or labeled as "organic" and would, therefore, not command a typical price premium. Additionally, if soils are contaminated from the pesticide drift, the farm could lose its USDA organic certification, which would require a 3-year recertification process.

Increased pesticide use under the No Program Alternative could result in pesticide drift, and depending on the type of pesticide used, may affect organic certification of crops and farms. Because the volume of pesticide use would increase throughout the primary and statewide Program Areas without the Proposed Program, the potential for adverse effects on the organic industry is higher than under existing conditions. **This increase in pesticide use is a potentially significant impact to the organic industry.**

3.2.3.6 Effects on Beneficial Insects and Agriculture

Under the No Program Alternative, LBAM control by individual farmers may have impacts on agriculturally beneficial insects based on the application of pesticides that may be harmful to bee colonies that serve as pollinators (direct impact). In turn, the potential exists for reduced crop pollination and subsequent declines in crop yields (indirect impacts). Chapter 12, Ecological Health, concludes that anticipated pesticide applications under the No Program Alternative could result in a potentially significant impact to nontarget invertebrates and pollinators. Accordingly, agricultural crop production and value could decline depending on the magnitude of impacts on pollinator species. However, assessing impacts on agricultural resources quantitatively would require information on potential physical impacts on bee populations and crop pollination; such data are not available. It is reasonable to assume that without an organized approach to pesticide application by individual farmers, individual treatments could utilize pesticides that are toxic to honeybees (Riedl et al. 2006) and crop yields could decline.

Because the quantity of pesticide use would increase under the No Program Alternative relative to existing conditions, the potential exists that beneficial insects would be adversely affected resulting in reduced crop yields and agricultural revenues. **This impact to beneficial insects and, therefore, crop yields and agricultural revenues, is potentially significant.**

3.2.3.7 Regional Economic Effects on Agricultural Support Industries

Potential damages to agricultural and horticultural commodities from LBAM infestation and increases in farm-level spending for pesticide applications would generate additional economic impacts throughout both the primary and statewide Program Areas. These regional economic impacts are based on a series of "ripple" effects that result as money is circulated throughout the economy because of inter-industry linkages. For this analysis, regional economic impacts are measured by changes in economic output (value of production),

income, and employment, and include both the direct effects attributed to the Proposed Program, as well as total impacts, which also capture indirect and induced effects.

Table 3-18 presents ranges of estimated regional economic impacts in the primary Program Area, organized by type of impact. In lieu of the Proposed Program, projected crop damage represents a loss in agricultural production and is a direct output effect. Projected losses in agricultural production range between -\$12.5 million and -\$155.7 million annually. Because crop damages would generally occur after crops are planted and actively farmed, they generally represent losses in producer income, and are shown as the direct impact on labor income. In terms of employment, no direct job losses are expected because the affected areas are assumed to be farmed as they normally would be until crop damages occur. These direct losses in agricultural revenues were input into the input-output models as reductions in household income (accounting for taxes and savings),⁵ which would affect the amount of spending in the economy. Because these effects are tied exclusively to changes in household spending, they are considered induced effects. The resultant estimates are that changes in agricultural income would result in additional losses of -\$10.7 to -\$133.7 million in output, for total output losses of -\$23.2 million to -\$289.4 million annually. Additional labor income impacts are estimated between -\$3.5 million to -\$44.8 million annually, for total income impacts ranging between -\$16.0 and -\$200.5 million per year. Reduced agricultural income is expected to generate employment losses totaling -68 to -851 jobs.

Table 3-18 Regional Economic Impacts under No Program (Primary Program Area)^{1,2}

Impact (Range)	Annual Output (\$ Million)		Annual Labor Income (\$ Million)		Employment (Jobs)	
	Direct	Total	Direct	Total	Direct	Total
Crop Damage³						
Low	(\$12.5)	(\$23.2)	(\$12.5)	(\$16.0)	0	(68)
High	(\$155.7)	(\$289.4)	(\$155.7)	(\$200.5)	0	(851)
Pesticide Expenditures						
Low	\$0.4	\$0.7	\$0.2	\$0.3	3	5
High	\$1.3	\$2.1	\$0.5	\$0.8	10	15
<i>Source:</i> ENTRIX 2009 ¹ Values reported in 2009 dollars. ² Total effects are the sum of direct, indirect, and induced effects. ³ Based on estimated crop damages from LBAM infestation under the No Program Alternative.						

Conversely, additional pesticide use by farmers anticipated under the No Program Alternative would generate additional spending in the regional economy, thereby generating regional economic benefits that would partially offset the impacts associated with crop damages. Overall, it is estimated that additional pesticide spending would range between \$1.4 million and \$3.9 million annually. Because pesticide spending would occur primarily at the retail level, with pesticide manufacturing assumed to mostly occur outside the primary Program Area, estimated spending levels do not translate directly into direct output effects. Instead, retail expenditures were used as inputs into the input-output model accounting for the assumed proportion of local pesticide manufacturing. The direct output effect of increased pesticide spending would range from \$0.4 to \$1.3 million annually, and the total output impacts would be between \$0.7 and \$2.1 million per year. The direct effect is an estimated increase in labor income from \$0.2 to \$0.5 million annually, and the total annual income effect is \$0.3 to \$0.8 million. Increased pesticide expenditures would also support 3 to 10 direct jobs and 5 to 15 total jobs in the primary Program Area.

⁵ In the primary Program Area, the disposable income rate is 71.2 percent of household income.

Table 3-19 presents the results of the regional economic analysis for the statewide Program Area following the same approach as that described above. Relative to crop damages, direct and total output impacts associated with reductions in agricultural income are estimated annual losses of -\$49.7 million to -\$620.7 million and -\$100.8 million to -\$1,260.4 million, respectively. Total labor income impacts are estimated to range between -\$66.2 million to -\$827.3 million per year, and total employment impacts range from -343 to -4,281 jobs.

Table 3-19 Regional Economic Impacts under No Program (Statewide Program Area) ^{1,2}

Measure	Annual Output (\$ Million)		Annual Labor Income (\$ Million)		Employment (Jobs)	
	Direct	Total	Direct	Total	Direct	Total
Crop Damage ³						
Low	(\$49.7)	(\$100.8)	(\$49.7)	(\$66.2)	0	(343)
High	(\$620.7)	(\$1,260.4)	(\$620.7)	(\$827.3)	0	(4,281)
Pesticide Expenditures						
Low	\$2.1	\$3.8	\$0.7	\$1.2	15	25
High	\$7.6	\$13.6	\$2.4	\$4.5	53	91
<i>Source:</i> ENTRIX 2009 ¹ Values reported in 2009 dollars. ² Total effects are the sum of direct, indirect, and induced effects. ³ Based on estimated crop damages from LBAM infestation under the No Program Alternative.						

Additional pesticide spending at the state level is expected to be substantial, estimated between \$5.4 million to \$19.4 million annually. The benefits associated with pesticide spending include direct output effects of between \$2.1 million and \$7.6 million annually, and total output effects of \$3.8 million to \$13.6 million per year. Additionally, direct and total annual income effects are estimated at \$0.7 to \$2.4 million and \$1.2 to \$4.5 million, respectively. Finally, direct employment benefits include 15 to 53 new jobs and total employment is expected to increase by approximately 25 to 91 throughout the state.

Under the No Program Alternative, the direct economic effects of associated reductions in agricultural income and increased pesticide expenditures would generate additional economic impacts in both the primary and statewide Program Areas. Reductions in agricultural income would lead to additional losses in total output, income, and employment. Conversely, increases in pesticide spending would generate economic benefits in the form of additional output, income, and jobs. Based on the magnitude of these expenditures, both beneficial and adverse, the net impact on regional economic activity would be negative. **This net impact on regional economic activity impact is potentially significant.**

3.2.4 Mating Disruption (Alternative MD)

3.2.4.1 Twist Ties (Alternative MD-1)

Effects on Agricultural Production and Land Uses

Under all of the Program alternatives, both chemical and nonchemical treatment methods, it is assumed that, in the long run, the proposed eradication methods would be successful in eradicating LBAM from currently infested areas (i.e., primary Program Area) and would prevent spread of LBAM throughout the state (i.e., statewide Program Area). In these cases, agricultural land is expected to remain in production and would not be converted to nonagricultural uses. The economic effects attributed to LBAM infestation may continue in

the short term during the treatment phase; however, these impacts would decrease as the pheromones break mating cycles. Based on the short-term nature of these effects, agricultural land is expected to remain in production.

Impact AG-1: Under all of the Program alternatives, LBAM would be eradicated from the primary Program Area and would not spread to other parts of the state; therefore, no reduction in agricultural production is anticipated relative to existing conditions and agricultural land would not be converted to nonagricultural uses. The potential exists that agricultural production would increase in currently infested areas without the threat of LBAM infestation. Overall, no impacts on agricultural and horticultural land uses would occur.

Effects on Agricultural Revenues (Crop Damages)

Under all of the Program alternatives, it is assumed that, in the long run, the proposed eradication methods would be successful in eradicating LBAM from currently infested areas (i.e., primary Program Area) and would prevent spread of LBAM throughout the state (i.e., statewide Program Area). In absence of the pest, no crop damages would occur and no impact on agricultural revenues would be attributed to LBAM under any of the Program alternatives.

Impact AG-2: Under all of the Program alternatives, LBAM would be eradicated from the primary Program Area and no crop damages would occur. Therefore, there would be no impact to agricultural revenues.

Effects on Agricultural Trade and Exports

Under all of the Program alternatives, it is assumed that, in the long run, the proposed eradication methods would be successful in eradicating LBAM from currently infested areas (i.e., primary Program Area) and would prevent spread of LBAM throughout the state (i.e., statewide Program Area). In absence of the pest, the typical domestic and foreign markets used by farmers and nursery operators would be available without quarantine restrictions, and agricultural exports may increase relative to existing conditions. Consequently, the Program alternatives are not expected to result in impacts on exports of California agricultural and nursery products.

Impact AG-3: Under all of the Program alternatives, LBAM would be eradicated from the primary Program Area and existing quarantine restrictions would no longer apply. Domestic and internal trade in LBAM host commodities may increase relative to existing conditions. Therefore, no impact would occur to agricultural trade and exports under the Program alternatives.

Effects on Farm-Level Production Costs

Under all of the Program alternatives, it is assumed that, in the long run, the proposed eradication methods would be successful in eradicating LBAM from currently invested areas (i.e., primary Program Area) and would prevent spread of LBAM throughout the state (i.e., statewide Program Area). In absence of the pest, farmers and nursery operators would not purchase and use pesticides to control LBAM. Rather, it is assumed that the Program alternatives would eradicate the pest. No impact on production costs relative to existing conditions would occur.

Impact AG-4: Under all of the Program alternatives, LBAM would be eradicated for the primary Program Area and would not spread to the statewide Program Area. No change in farm-level or nursery production costs would be attributable to LBAM relative to existing conditions. No impact would occur.

Effects on Organic Farming

Twist ties with pheromones used to treat LBAM are an approved for organic farmers. No impacts to organic farmers are anticipated under Alternative MD-1.

Impact AG-5: Because Alternative MD-1 complies with organic farming standards, no impact would occur.

Effects on Beneficial Insects and Agriculture

According to Chapter 12, Ecological Health, Alternative MD-1 would not result in toxic effects to pollinators. Therefore, no corresponding impacts would occur to agricultural production and values.

Impact AG-6: Because Alternative MD-1 is not toxic to beneficial insects, no change in crop pollination would occur relative to existing conditions. No impact would occur.

Regional Economic Effects on Agricultural Support Industries

Under all of the Program alternatives, including Alternative MD-1, it is assumed that LBAM would be successfully eradicated from the primary Program Area; therefore, no long-term crop damages would affect producer income and no change in pesticide spending would occur relative to existing conditions. Further, changes in regional economic activity attributed to these direct effects would not occur. Overall, no impact on regional economic conditions would occur, and under the Program alternatives, the regional impacts described under the No Program Alternative would be avoided.

Impact AG-7: No change in agricultural income or pesticide spending would occur under the Program alternatives relative to existing conditions. No impacts on regional economic activity would occur.

3.2.4.2 Ground Application (Alternative MD-2)

The LBAM pheromone treatment compound would use ground-based equipment for application to trees, shrubs, and utility poles as described in Section 2.3.2.2, Ground Application (Alternative MD-2).

Effects on Agricultural Production and Land Uses

Anticipated effects on agricultural and land uses would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

Effects on Agricultural Revenues (Crop Damages)

Anticipated effects on agricultural revenues associated with crop damages to LBAM host commodities would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

Effects on Agricultural Trade and Exports

Anticipated effects on agricultural trade and exports would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

Effects on Farm-Level Production Costs

Anticipated effects on farm-level production costs would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

Effects on Organic Farming

Similar to twist ties (Alternative MD-1), ground applications of pheromones to treat LBAM infestations are consistent with organic farming guidelines. Consequently, no impact to organic farmers would occur under Alternative MD-2.

Effects on Beneficial Insects and Agriculture

Chapter 12, Ecological Health, concludes that, due to uncertainties in the modeling, the potential exists for toxicity impacts to beneficial insects associated with implementation of Alternative MD-2; however, toxicity impacts on pollinator species are not anticipated. Accordingly, potential impacts on crop pollination, agricultural production, and losses in crop values would be negligible.

Impact AG-8: Based on the toxicity modeling, Alternative MD-2 would not have impacts on pollinator species and, therefore, impacts on crop production and values are not anticipated. This impact would be less than significant. No mitigation is required.

Regional Economic Effects on Agricultural Support Industries

Assuming successful eradication, anticipated effects on regional economic conditions would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.4.3 Aerial Application (Alternative MD-3)

Aerial applications of LBAM-specific pheromones would be used to treat denser LBAM populations. The area for application is a 1.5-mile radius around each location where LBAM is detected in an undeveloped area.

Effects on Agricultural Production and Land Uses

Anticipated effects on agricultural and land uses would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

Effects on Agricultural Revenues (Crop Damages)

Anticipated effects on agricultural revenues associated with crop damages to LBAM host commodities would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

Effects on Agricultural Trade and Exports

Anticipated effects on agricultural trade and exports would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

Effects on Farm-Level Production Costs

Anticipated effects on farm-level production costs would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

Effects on Organic Farming

The use of the aerial application of pheromones is consistent with USDA National Organic Program Standards. The California Certified Organic Farmers,⁶ which bases its certification on the USDA standards, does not endorse aerial applications of pheromones in LBAM eradication efforts (Reed, pers. comm., 2009). However, this lack of endorsement does not affect organic farmers' ability to sell or label crops as organic, and it does not affect farm-level certification. Public protests have taken place about the perceived safety and health risks associated with aerial application of pheromones, which has caused some consumers to threaten a boycott of organic produce that has been treated with this method (Reed, pers. comm., 2009).

Impact AG-9: No impact on organic farming certifications would occur under Alternative MD-3. Assuming the publication of this PEIR with the Human Health and Ecological Risk Assessments (see Appendices D and F, respectively) and Sections 8.2 and 12.2 would educate this subset of consumers, the impact to organic farm revenues would be less than significant. No mitigation is required.

Effects on Beneficial Insects and Agriculture

Anticipated effects on beneficial insects would be comparable to Alternative MD-2, less than significant impact (Section 3.2.4.1).

Regional Economic Effects on Agricultural Support Industries

Assuming successful eradication, anticipated effects on regional economic conditions would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.5 Male Moth Attractant (Alternative MMA)

Alternative MMA involves ground treatment with LBAM-specific pheromones combined with permethrin to attract and kill male moths. Alternative MMA would be conducted in advance of the release of sterile moths (Alternative SIT) or *Trichogramma* stingless wasps (Alternative Bio-P) to enhance their efficacy. The treatment area consists of a 1.5-mile radius around any detection site, and the material would be applied to street trees and utility poles. MMA treatment sites would be out of reach of the general public. The method of application would be the same as that discussed for the ground application in Section 2.3.2.2, Ground Application (Alternative MD-2).

⁶ The California Certified Organic Farmers certifies to the USDA National Organic Program standards and is one of the oldest and largest organic certification and trade associations in North America.

3.2.5.1 Effects on Agricultural Production and Land Uses

Anticipated effects on agricultural and land uses would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.5.2 Effects on Agricultural Revenues (Crop Damages)

Anticipated effects on agricultural revenues associated with crop damages to LBAM host commodities would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.5.3 Effects on Agricultural Trade and Exports

Anticipated effects on agricultural trade and exports would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.5.4 Effects on Farm-Level Production Costs

Anticipated effects on farm-level production costs would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.5.5 Effects on Organic Farming

Alternative MMA involves the integrated use of pheromones and permethrin with ground application methods. The use of permethrin is prohibited for organic use by the USDA's National Organic Program Standards. These standards, however, address the circumstances for federal or state emergency pest or disease treatment (California Certified Organic Farmers 2007). In these situations, if a prohibited substance is applied to a certified farming operation due to a federal or state emergency pest or disease treatment program and the farming operation otherwise meets all other requirements, the certification status of the farming operation is not affected. However, any harvested crop or plant that has contact with the prohibited substance(s) applied as the result of a federal or state emergency pest or disease treatment program cannot be sold, labeled, or represented as organically produced. Those certified organic operations would, therefore, be unable to command the premium farm prices typically received for such products. The affected farms would compete directly with many other farms at lower prices than realized for organically produced crops. The decreased in organic farm revenues would remain until the organic farm can harvest a new crop recertified as organic. In addition, any contact with a prohibited substance such as permethrin can also result in soil contamination. Soil contamination can result in revocation of farm-level organic certification, and recertification requires a minimum of 3 years from the last exposure to the prohibited substance.

Impact AG-10: **Alternative MMA with its use of permethrin would have a potentially significant but mitigable impact on the organic farming industry throughout California.**

Mitigation Measure AG-10: Do not apply materials containing permethrin on or adjacent to organic farming operations.

Significance after Mitigation: Less than significant.

3.2.5.6 Effects on Beneficial Insects and Agriculture

According to the USEPA, permethrin toxicity data show that the compound is highly toxic to honeybees, as well as other beneficial insects, particularly when they are exposed to direct treatment on blooming crops or

weeds. To avoid these impacts, permethrin should not be allowed to drift to blooming crops or weeds while bees are actively visiting the treatment area (USEPA 2006a).

According to Chapter 12, Ecological Health, due to the height of applications, application on street trees and utility poles in localized dollops, and the fact that permethrin acts as a strong repellent to bees, contact with beneficial insects is unlikely and little potential exists for toxicity impacts on nontarget insects and pollinators. Accordingly, the potential for effects on crop pollination and production is limited.

Impact AG-11: The potential for MMA applications to adversely affect pollinators, including honeybee populations, in either the primary or statewide Program Areas is limited. Therefore, the impacts on agricultural production and values would be less than significant.

3.2.5.7 Regional Economic Effects on Agricultural Support Industries

Assuming successful eradication, anticipated effects on regional economic conditions would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.6 Organically Approved Insecticides (Alternatives Btk and S)

Alternatives Btk and S include pesticidal control use of *Bacillus thuringiensis kurstaki* and spinosad. Both of these treatments are applied by hydraulic spraying using either truck-based or backpack-based equipment. Foliar ground treatments with Btk may be made where heavier larval populations are detected.

3.2.6.1 Effects on Agricultural Production and Land Uses

Anticipated effects on agricultural and land uses would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.6.2 Effects on Agricultural Revenues (Crop Damages)

Anticipated effects on agricultural revenues associated with crop damages to LBAM host commodities would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.6.3 Effects on Agricultural Trade and Exports

Anticipated effects on agricultural trade and exports would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.6.4 Effects on Farm-Level Production Costs

Anticipated effects on farm-level production costs would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.6.5 Effects on Organic Farming

Pesticidal control alternatives include the use of Btk and spinosad in targeted areas. Both of these treatments are applied in ground applications. USDA's National Organic Program Standards have approved the use DiPel DF (Btk) and Entrust® (spinosad).

Impact AG-12: With proper use and application, Alternatives Btk and S would have no impact on organic farming.

3.2.6.6 Effects on Beneficial Insects and Agriculture

Applications of Btk and spinosad pose potential risks on beneficial insects, specifically lepidopteran species including butterflies (USEPA 2002a). These pesticides are not harmful to honeybees. If applications of Btk and spinosad were to substantially affect butterfly populations, adverse effects on crop pollination rates and a decline in agricultural yields and revenues could occur. However, the applications would be short term and localized to avoid affecting beneficial insects at a population level over the long term. The insect populations would be expected to recover.

Impact AG-13: Localized applications of Btk and spinosad could harm small numbers of beneficial insects if present during the treatment. Because these effects would be short term and are not expected to result in long-term population level impacts, the impact on agricultural production and values would be less than significant.

3.2.6.7 Regional Economic Effects on Agricultural Support Industries

Assuming successful eradication, anticipated effects on regional economic conditions would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.7 Inundative Parasite Wasp Releases (Alternative Bio-P)

Inundative *Trichogramma* species (stingless parasite wasp) releases may be made in areas with more than 50 LBAM detections. This form of biological control would use native, commercially available parasitic wasps.

3.2.7.1 Effects on Agricultural Production and Land Uses

Anticipated effects on agricultural and land uses would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.7.2 Effects on Agricultural Revenues (Crop Damages)

Anticipated effects on agricultural revenues associated with crop damages to LBAM host commodities would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.7.3 Effects on Agricultural Trade and Exports

Anticipated effects on agricultural trade and exports would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.7.4 Effects on Farm-Level Production Costs

Anticipated effects on farm-level production costs would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.7.5 Effects on Organic Farming

Anticipated effects on agricultural trade and exports would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

Impact AG-14: USDA's National Organic Program Standards approve the use of parasitic wasps as a biological control method; therefore, no impacts to organic farming would occur.

3.2.7.6 Effects on Beneficial Insects and Agriculture

Anticipated effects on beneficial insects would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.7.7 Regional Economic Effects on Agricultural Support Industries

Assuming successful eradication, anticipated effects on regional economic conditions would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.8 Sterile Insect Technique (Alternative SIT)

3.2.8.1 Effects on Agricultural Production and Land Uses

Anticipated effects on agricultural and land uses would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.8.2 Effects on Agricultural Revenues (Crop Damages)

Anticipated effects on agricultural revenues associated with crop damages to LBAM host commodities would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.8.3 Effects on Agricultural Trade and Exports

Anticipated effects on agricultural trade and exports would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.8.4 Effects on Farm-Level Production Costs

Anticipated effects on farm-level production costs would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.8.5 Effects on Organic Farming

SIT will be the primary tool for LBAM eradication in California when it becomes fully operational. This alternative entails the release of sterile moths into the environment to disrupt mating and eradicate the population.

Impact AG-15: Sterile insects used to treat disrupt LBAM populations are an approved treatment method for organic farmers. As a result, no impacts to organic farming would occur under Alternative SIT.

3.2.8.6 Effects on Beneficial Insects and Agriculture

Anticipated effects on beneficial insects would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.8.7 Regional Economic Effects on Agricultural Support Industries

Assuming successful eradication, anticipated effects on regional economic conditions would be comparable to Alternative MD-1, no impact (Section 3.2.4.1).

3.2.9 Cumulative Impacts

A range of approaches to LBAM eradication have been outlined in the Program alternatives. It is expected that LBAM eradication will take between 3 and 5 years using these treatments. During that time, LBAM infestations may continue to spread until full-scale eradication and treatment activities are implemented. For this PEIR, cumulative impacts on agricultural and economic resources are based on the effects of the Program alternatives together with the effects of past, present, and reasonably foreseeable actions in the Program Area on such resources. As described in this chapter, the Program alternatives are not expected to have impacts on agricultural production and land use, agricultural revenues, trade and exports, farm-level production costs, and regional economic conditions (i.e., regional and statewide employment, output, and income). In fact, the Program's cumulative impact on these parameters would appear to be beneficial because in the long term it would contribute considerably to the sustainability of both conventional and organic agricultural practices by eliminating the present threat from LBAM. None of the alternatives is expected to result in land use disturbances or changes in land use. Conversion of farmland to nonagricultural uses would not be affected. However, the Program alternatives have the potential to result in impacts on organic farming and beneficial insects from increased pesticide use; accordingly, these parameters are the focus of this cumulative analysis.

The Program alternatives will add to the total amount of pesticide materials used annually in California until LBAM is eradicated. The number of future LBAM infestations across the state is unknown, however, and cannot be quantified. For the agricultural and horticultural resource analysis, it is assumed that the Program alternatives will include multiple pesticide applications based on the LBAM life cycle and over a sufficiently long period to eradicate LBAM (3 to 5 years). It is also assumed under the Program alternatives that individual farmers and nursery operators will not apply pesticide materials independently and incur the costs thereof once eradication in an area is accomplished. However, because the additional quantities of pesticides that will be applied under the Program alternatives are variable, cumulative impacts are difficult to evaluate. See Section 12.2.9 for further discussion of pesticide use.

In the context of organic farming, potential impacts associated with pesticide applications near organic farming operations are expected to be temporary, Program-specific, and mitigable to less than significant, rather than cumulatively considerable. For example, some farmers could temporarily lose their organic certifications due to permethrin use under Alternative MMA if it were to contaminate soil, but because these

impacts are not only short term but can be avoided entirely with the selection of treatment sites away from organic farming operations, it is not considered a cumulatively considerable impact. Similarly, any disruption to pollinators/honeybees and pollination would be highly localized to the treatment area and temporary, lasting only during the eradication period; therefore, from a cumulative perspective the impact would be less than significant. Moreover, in the case of both impacts, no known past, present, and reasonably foreseeable “actions” in the Program Area are adversely affecting organic agriculture or agriculturally beneficial insects with one exception. The decline in honeybees from Colony Collapse Disorder is not fully understood and may be due to a combination of factors including diseases, pesticides, and migratory beekeeping. Therefore, the LBAM Program’s less-than-significant, incremental impacts would not contribute considerably to impacts to organic farming and beneficial insects important to agricultural and horticultural resources.

3.2.10 Environmental Impacts Summary

Table 3-20 is a summary comparison of all of the potential economic impacts, including no impacts, associated with the No Program and Program alternatives relative to existing conditions. The number of each statement correlates to its number in the text.

3.2.11 Mitigation and Monitoring

Only one impact is potentially significant and it is Alternative MMA’s use of permethrin that could impact organic farming.

Impact AG-10: Alternative MMA with its use of permethrin would have a potentially significant but mitigable impact on the organic farming industry throughout California.

Mitigation Measure AG10: Do not apply materials containing permethrin on or adjacent to organic farming operations.

Location: Program Area agricultural treatment areas

Monitoring / Reporting Action: CDFA would identify organic operations in advance of treatment to avoid applications on these properties.

Effectiveness Criteria: Monitor treatment crews for compliance with GPS technology.

Responsible Agency: CDFA

Timing: Prior to applications

Table 3-20 Summary Comparison of Impacts of Alternatives

Impact Statement	No Program	MD-1	MD-2	MD-3	MMA	Btk and S	Bio-P	SIT
Agricultural & Horticultural Resources and Economics								
Effects on Agricultural Production and Land Uses	PS	N	N	N	N	N	N	N
Impact AG-1: Under all of the Program alternatives, LBAM would be eradicated from the primary Program Area and would not spread to other parts of the state; therefore, no reduction in agricultural production is anticipated relative to existing conditions and agricultural land would not be converted to nonagricultural uses.	na	N	N	N	N	N	N	N
Effects on Agricultural Revenues (Crop Damages)	PS	N	N	N	N	N	N	N
Impact AG-2: Under all of the Program alternatives, LBAM would be eradicated from the primary Program Area and no crop damages would occur.	na	N	N	N	N	N	N	N
Effects on Agricultural Trade and Exports	N	N	N	N	N	N	N	N
Impact AG-3: Under all of the Program alternatives, LBAM would be eradicated from the primary Program Area and existing quarantine restrictions would no longer apply. Domestic and internal trade in LBAM host commodities may increase relative to existing conditions.	na	N	N	N	N	N	N	N
Effects on Farm-Level Production Costs	PS	N	N	N	N	N	N	N
Impact AG-4: Under all of the Program alternatives, LBAM would be eradicated for the primary Program Area and would not spread to the statewide Program Area.	na	N	N	N	N	N	N	N
Effects on Organic Farming	PS	N	N	N	SM	N	N	N
Impact AG-5: Because Alternative MD-1 complies with organic farming standards, no impact would occur.	na	N	na	na	na	na	na	na
Impact AG-9: No impact on organic farming certifications would occur under Alternative MD-3.	na	na	na	LS	na	na	na	na
Impact AG-10: Alternative MMA with its use of permethrin would have a potentially significant but mitigable impact on the organic farming industry throughout California.	na	na	na	na	SM	na	na	na
Impact AG-12: With proper use and application, Alternatives Btk and S would have no impact on organic farming.	na	na	na	na	na	N	na	na
Impact AG-14: USDA's National Organic Program Standards approve the use of parasitic wasps as a biological control method	na	na	na	na	na	na	N	na
Impact AG-15: Sterile insects used to treat disrupt LBAM populations are an approved treatment method for organic farmers.	na	na	na	na	na	na	na	N
Effects on Beneficial Insects and Agriculture	PS	N	LS	LS	LS	LS	N	N
Impact AG-6: Because Alternative MD-1 is not toxic to beneficial insects, no change in crop pollination would occur relative to existing conditions.	na	N	na	na	na	na	na	na

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Table 3-20 Summary Comparison of Impacts of Alternatives

Impact Statement	No Program	MD-1	MD-2	MD-3	MMA	Btk and S	Bio-P	SIT
Impact AG-8: Based on the toxicity modeling, Alternative MD-2 would not have impacts on pollinator species and, therefore, impacts on crop production and values are not anticipated.	na	na	LS	na	na	na	na	na
Impact AG-11: The potential for MMA applications to adversely affect pollinators, including honeybee populations, in either the primary or statewide Program Areas is limited. Therefore, the impacts on agricultural production and values would be less than significant.	na	na	na	na	LS	na	na	na
Impact AG-13: Localized applications of Btk and spinosad could harm small numbers of beneficial insects if present during the treatment. Because these effects would be short term and are not expected to result in long-term population level impacts, the impact on agricultural production and values would be less than significant.	na	na	na	na	na	LS	na	na
Regional Economic Effects on Agricultural Support Industries	PS	N	N	N	N	N	N	N
Impact AG-7: No change in agricultural income or pesticide spending would occur under the Program alternatives relative to existing conditions.	na	N	N	N	N	N	N	N
Key: LS = Less-than-significant impact N = No impact na = Not applicable PS = Potentially significant impact (Applies to No Program only. Program alternatives have either feasible mitigations or unavoidable impacts.) SM= Potentially significant but mitigable impact SU = Potentially significant and unavoidable impact								