

APPENDIX B

Agricultural & Horticultural
Resources and Economics

LIGHT BROWN APPLE MOTH ERADICATION PROGRAM

Draft

Programmatic Environmental Impact Report

AGRICULTURAL & HORTICULTURAL RESOURCES AND ECONOMICS

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Abbreviations & Acronyms

Bio-P	Inundative Parasite Wasp Releases (Alternative)
Btk	<i>Bacillus thuringiensis kurstaki</i> (Alternative)
CCD	Colony Collapse Disorder
CCOF	California Certified Organic Farmers
CDFA	California Department of Food and Agriculture
FSZ	Farmland Security Zone
LBAM	light brown apple moth
MD	Mating Disruption (Alternative)
MMA	Male Moth Attractant (Alternative)
NAICS	North American Industrial Classification System
Program	Light Brown Apple Moth Eradication Program
SIT	Sterile Insect Technique (Alternative)
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency

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Introduction

The light brown apple moth (LBAM) has been classified by the California Department of Food and Agriculture (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.¹ LBAM may consequently cause economic impacts that have physical impacts on agricultural and horticultural resources in California. This section evaluates the potential economic impacts of LBAM by assessing the environmental setting, regulatory environment, and environmental impacts and mitigation on agricultural and horticultural resources of the Proposed LBAM Eradication Program (Program) as well as lack of eradication. It also addresses the associated economic impacts on affected farmers, as well as the regional economic impacts tied to changes in agricultural production and costs. The purposes of integrating economic information into the analysis of agricultural resources are to demonstrate the close relationship between economic factors and physical effects on agricultural production, provide context to potential agricultural impacts, and show the importance of agriculture to local economies and the state.

Several key issues surround the relationship among the LBAM, agriculture, and economics. First, LBAM has the potential to cause damage to a broad spectrum of crops, nursery products, and other plants. Within California, more than 250 fruits and vegetables and over 1,000 plant species are vulnerable to the pest.² The agricultural crops susceptible to damage include grapes, citrus, a variety of stone fruits such as peaches, plums, cherries, and apricots, and other fruits and vegetables.

Second, if not eradicated, LBAM may spread throughout California, including the highly productive agricultural sector in the Sacramento and San Joaquin Valleys. In addition to causing direct losses of agricultural and nursery crops in affected areas, LBAM infestations lead to import restrictions established by several countries.

Third, 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 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.

Other ancillary issues tied to both the LBAM eradication and noneradication scenarios include potential effects on beneficial insects and effects on organic farming and certification. If the Program is not implemented, farmers and nursery operators will very likely spray to control the pest. Some of the pesticide materials available for LBAM control may have adverse impacts on beneficial insects such as honeybees and others that pollinate many crops. Further, pesticide applications on land proximate to organic farms may result in the loss of organic certification on those farms. More broadly, because of the many economic linkages from agricultural and nursery industries to other support industries, any impacts on farms and nurseries are likely to have many ripple effects throughout local economies.

¹ Johnson, Marshall W. et al. July 17, 2007. Light Brown Apple Moth in California: Quarantine, Management and Potential Impacts. University of California Statewide Integrated Pest Management Program. Davis.

² California Department of Food and Agriculture. Plant Health, Light Brown Apple Moth, Background. Website (http://www.aphis.usda.gov/plant_health/plant_pest_info/lba_moth/index.shtml) accessed on March 27, 2009

The primary agricultural topics addressed in this section include agricultural production and revenues, agricultural trade and exports, farm-level production costs, organic farming, beneficial insects to agriculture, and regional economic impacts associated with the agricultural and horticultural industries. The primary economic variables considered in the evaluation of economic impacts are employment and income.

Two sections follow. The first is the Environmental Setting (Section B1), which provides a snapshot of existing agricultural and economic conditions in the study area. The second is Environmental Impacts and Mitigation Measures (Section B2), which includes the results of the impact analysis. It comprises a discussion of evaluation concerns and significance criteria, the conceptual framework and methodologies used to analyze impacts, impact analyses organized by Program alternative, and proposed mitigation measures.

Environmental Setting

This section provides a general background on demographic and socioeconomic characteristics of the Program Area, as well as a comprehensive overview of agricultural and related economic conditions that may be affected by the Program. It also establishes baseline agricultural and economic conditions against which the potential impacts of the No Program and Program alternatives are evaluated. The data used to establish baseline conditions are from several federal, state, and local sources. Agricultural data are from the U.S. Department of Agriculture (USDA), California office of the National Agricultural Statistics Service, University of California Cooperative Extension Service, University of California Agricultural Issues Center, and county agricultural commissioners. Economic and demographic data are from the U.S. Department of Commerce-Bureau of Economic Analysis, U.S. Census Bureau, California Department of Finance, and California Economic Development Department.

B2.1 PROGRAM AREAS

The selection of study areas for the No Program and Program alternatives is based on the spatial extent of potential LBAM infestation and impacts. The chosen study areas also influence the magnitude of regional economic impacts.

For this analysis, the primary Program Area is defined as the 13 counties in which LBAM has been found: 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. Accordingly, the data reported in this section cover these 13 counties individually and collectively. If eradication efforts are not implemented, the potential LBAM infestation could extend throughout many parts of the state. While the extent of the spread may include irrigated and other areas beyond the 13 counties in the primary Program Area, the full area of infestation absent the Program is not certain. Dowell³ asserts that LBAM will continue to spread throughout those areas of the state that can support the insect, which could include most of the state. Consequently, the Affected Environment also includes a statewide Program Area for which state-level data are presented where applicable.

B2.2 DEMOGRAPHIC CHARACTERISTICS

This section provides an overview of the demographic characteristics of the Program Areas, both primary and statewide, which provides context to potential socioeconomic effects of the Proposed Program. Key measures considered include population and race and ethnicity.

B2.2.1 Population

In 2007, California population was estimated at 37.6 million,⁴ and the primary Program Area represented 22.3 percent of the total. The primary Program Area includes much of the San Francisco Bay Area and

³ Dowell, Robert V. A Partial Analysis of the Potential Increase in Pesticide Use Light Brown Apple Moth Might Cause in Commercial Agriculture and Uncultivated Settings in California. California Department of Food and Agriculture. Sacramento.

⁴ California Department of Finance. August 2007. E-4 Historical Population Estimates for City, County and the State, 1991–2000, with 1990 and 2000 Census Counts. Sacramento.

Central California coast regions. As shown in Table B-1, nearly 8.4 million people were living in the 13-county primary Program Area in 2007.⁵ The three counties of Alameda, Contra Costa, and Santa Clara collectively accounted for 4.4 million people and 52 percent of the population in the 13-county area.

Population in the primary Program Area grew 1.2 percent annually between 1990 and 2000, while that in the state grew 1.3 percent annually. San Benito County grew the most rapidly at 3.8 percent annually, followed by Contra Costa at 2.4 percent and Sonoma County at 1.7 percent. Between 2000 and 2007, population within the primary Program Area grew by approximately 0.9 percent annually while the overall state grew at 1.5 percent annually.

Table B-1 Population and Population Growth in the Program Areas (1990–2007)

County/Area	Population			Population Growth (Compound Annual Average)	
	1990	2000	2007	1990–2000	2000–2007
Alameda	1,276,702	1,443,939	1,522,197	1.2%	0.8%
Contra Costa	803,732	948,816	1,051,674	2.4%	1.5%
Marin	230,096	247,289	255,080	1.0%	0.4%
Monterey	355,660	401,762	423,762	1.2%	0.8%
Napa	110,765	124,279	134,844	1.2%	1.2%
San Benito	36,697	53,234	57,296	3.8%	1.1%
San Francisco	723,959	776,733	812,241	0.7%	0.6%
San Mateo	649,623	707,163	730,339	0.9%	0.5%
Santa Barbara	369,608	399,347	423,540	0.8%	0.8%
Santa Clara	1,497,577	1,682,585	1,805,314	1.2%	1.0%
Santa Cruz	229,734	255,602	263,499	1.1%	0.4%
Solano	339,471	394,930	422,974	1.5%	1.0%
Sonoma	388,222	458,614	479,668	1.7%	0.6%
Primary Program Area	7,011,846	7,894,293	8,382,428	1.2%	0.9%
Statewide Program Area	29,758,213	33,873,086	37,559,540	1.3%	1.5%

Population projections for the state and primary Program Areas through 2030 are shown in Table B-2. Statewide growth between 2000 and 2010 is projected at 1.5 percent annually, with population expanding from 33.9 million to 39.1 million⁶. Comparable growth in the primary Program Area is projected at 0.8 percent annually over the period, from nearly 7.9 million in 2000 to 8.5 million by 2010. Growth is expected at 0.9 percent annually between 2020 and 2030. Among counties, San Benito and Solano counties are projected to grow most rapidly (2.1 percent and 1.6 annually, respectively). San Francisco is expected to grow most slowly at 0.1 percent annually over this period.

⁵ California Department of Finance. May 2008. E-1 Population Estimates for Cities, Counties and the State with Annual Percent Change — January 1, 2007 and 2008. Sacramento.

⁶ California Department of Finance. July 2007. Population Projections by Race/Ethnicity, Gender and Age for California and Its Counties 2000–2050. Sacramento.

Table B-2 Population Projections in the Program Areas (2000–2030)

County/Area	Population Projection			Population Growth (Compound Annual Rate)		
	2010	2020	2030	2000–2010	2010–2020	2020–2030
Alameda	1,550,133	1,663,481	1,791,721	0.7%	0.7%	0.7%
Contra Costa	1,075,931	1,237,544	1,422,840	1.3%	1.4%	1.4%
Marin	253,682	260,305	273,151	0.3%	0.3%	0.5%
Monterey	433,283	476,642	529,145	0.8%	1.0%	1.1%
Napa	142,767	165,786	191,734	1.4%	1.5%	1.5%
San Benito	64,230	83,792	103,340	1.9%	2.7%	2.1%
San Francisco	818,163	844,466	854,675	0.5%	0.3%	0.1%
San Mateo	736,667	761,455	786,069	0.4%	0.3%	0.3%
Santa Barbara	434,497	459,498	484,570	0.8%	0.6%	0.5%
Santa Clara	1,837,361	1,992,805	2,192,501	0.9%	0.8%	1.0%
Santa Cruz	268,016	287,480	304,465	0.5%	0.7%	0.6%
Solano	441,061	503,248	590,166	1.1%	1.3%	1.6%
Sonoma	495,412	546,151	606,346	0.8%	1.0%	1.1%
Primary Program Area	8,551,203	9,282,653	10,130,723	0.8%	0.8%	0.9%
Statewide Program Area	39,135,676	44,135,923	49,240,891	1.5%	1.2%	1.1%

B2.2.2 Race and Ethnicity

The 2004 racial and ethnic composition of the primary and statewide Program Areas is presented in Table B-3. In the primary Program Area, the three largest racial groups are White (Caucasian), Hispanic, and Asian; together, these groups comprise approximately 90.5 percent of the total regional population.⁷ Other racial groups, combined, represent 9.5 percent of the regional total, with Black/African Americans accounting for 6.3 percent. The proportion of Hispanics living and working in the primary Program Area is less than the statewide figure of 34.8 percent (2004)⁸.

Racial composition varies substantially among counties within the primary Program Area. Monterey County has the lowest White population at 36.1 percent and the highest Hispanic/Latino population at 52.4 percent, representative of areas with a large agricultural industry. Conversely, Marin County has the highest White population at 76.4 percent and the second lowest Hispanic/Latino population at 14.1 percent. Solano County is more racially diversified than other counties in the primary Program Area, with the largest percentage of percent Black/African Americans (13.2 percent) and Multiracial persons (3.5 percent), and second highest American Indian/Alaskan Natives (0.6 percent).

⁷ California Department of Finance, July 2004. California County Race/ethnic Population Estimates with Components of Change by Year July 1, 2000–2004. Sacramento.,

⁸ *ibid*

Table B-3 Race/Ethnicity in the Program Areas (2004)

County/Area	Race (Percent of Total Population) ¹						
	White	Black / African American	American Indian / Alaska Native	Asian	Native Hawaiian / Pacific Islander	Multiracial	Hispanic / Latino
Alameda	39.1%	13.1%	0.4%	22.6%	0.7%	2.7%	21.4%
Contra Costa	55.8%	8.7%	0.4%	11.9%	0.4%	2.1%	20.7%
Marin	76.4%	2.9%	0.3%	4.2%	0.1%	2.0%	14.1%
Monterey	36.1%	2.8%	0.5%	6.0%	0.4%	1.9%	52.4%
Napa	64.4%	1.2%	0.6%	4.1%	0.2%	1.7%	27.9%
San Benito	42.6%	1.0%	0.6%	2.4%	0.1%	1.4%	51.8%
San Francisco	44.7%	7.1%	0.3%	31.2%	0.5%	2.6%	13.5%
San Mateo	46.6%	3.5%	0.2%	22.3%	1.4%	2.4%	23.7%
Santa Barbara	56.35%	2.40%	0.58%	4.06%	0.15%	1.58%	34.9%
Santa Clara	43.0%	2.7%	0.4%	26.6%	0.4%	2.2%	24.8%
Santa Cruz	61.3%	0.9%	0.5%	4.2%	0.1%	1.9%	31.1%
Solano	47.3%	13.2%	0.6%	14.2%	0.8%	3.5%	20.4%
Sonoma	71.0%	1.4%	0.9%	3.9%	0.2%	2.2%	20.5%
Primary Program Area	48.3%	6.3%	0.4%	18.1%	0.5%	2.3%	24.0%
Statewide Program Area	44.6%	6.0%	0.6%	11.6%	0.4%	2.0%	34.8%

Sources: California Department of Finance. 2004. *California County Race/ethnic Population Estimates with Components of Change by Year July 1, 2000-2004*. July. Sacramento.
¹ Represents an average for the primary Program Area counties, weighted by population.

B2.3 ECONOMIC INDICATORS

Economic indicators considered in this section include employment and major industries, unemployment, and income and earnings for both the primary Program Area and the state. Economic data at the industry-level are provided where available. This section also addresses these economic indicators from a socioeconomic perspective of the affected population.

B2.3.1 Employment and Major Industries

Table B-4 shows total employment and employment growth between 1990 and 2006 in both the primary Program Area and state. The 13-county area had about 5.0 million part- and full-time jobs in 2006, which represented 24.6 percent of statewide employment.⁹ 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. Alameda County had the second largest number of jobs at 887 thousand (17.6 percent). San Benito and Napa counties had the smallest number of jobs at 23 thousand and 90 thousand jobs (0.5 and 1.8 percent, respectively).

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 in the entire area (approximately 224,000 jobs). Employment in Santa Clara, San

⁹ U.S. Department of Commerce, Bureau of Economic Analysis, 2006, Personal Income and Employment Summary (Table CA04)

Francisco, and San Mateo counties declined 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 B-4 Employment and Employment Growth in the Program Areas (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%
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: U.S. Department of Commerce, Bureau of Economic Analysis 2006 (CA04: Personal income and employment summary)

Employment by industry under existing conditions¹⁰ for the primary Program Area is presented in Table B-5. The largest sector in 2006 was Other Services, which employed over 2.6 million people and accounted for over half of the regional job base.¹¹ Other leading sectors included wholesale and retail trade, providing 12.1 percent of total jobs, and federal, state, and local government, providing 11.7 percent. In 2006, farm employment in the primary Program Area was 51,183, or 1.0 percent of the 13-county total. The most farm jobs were in Monterey County, 14,826, which represented 29.0 percent of the 13-county total. Santa Barbara and Sonoma counties had the next highest proportions of agricultural jobs at 17.4 and 12.5 percent, respectively.

¹⁰ 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 historical trends at the industry level.

¹¹ U.S. Department of Commerce, Bureau of Economic Analysis, 2006. Total Full-Time and Part-Time Employment by NAICS Industry (Table CA25N)

Table B-5 Employment by Industry in the Program Area (2006)

County/Area	Industry / Sector ¹										Total
	Farm/ Agriculture	Natural Resources and Mining	Construction	Manufacturing	Wholesale and Retail Trade	Transportation and Warehousing	Utilities	Finance and Insurance	Other Services	Government	
Alameda	1,017	1,004	54,277	79,555	130,449	(D)	(D)	35,560	433,212	120,047	855,121
Contra Costa	1,056	2,341	39,367	21,912	68,557	9,490	1,621	37,223	266,008	49,880	497,455
Marin	691	(D)	12,149	3,351	22,467	1,546	251	12,202	113,217	14,415	180,289
Monterey	14,826	30,068	11,016	6,949	27,772	3,768	552	6,370	89,003	35,394	225,718
Napa	3,383	2,784	6,922	11,663	9,900	1,575	170	2,777	40,562	9,913	89,649
San Benito	1,382	(D)	2,473	3,019	3,054	(D)	(D)	586	7,520	2,975	21,009
San Francisco	0	1,053	22,842	13,230	67,035	(D)	(D)	59,077	423,321	97,736	684,294
San Mateo	1,780	912	24,579	31,881	(D)	28,898	(D)	25,555	255,491	31,744	400,840
Santa Barbara	8,891	1,946	14,945	14,945	29,251	3,381	480	8,090	129,279	37,933	249,141
Santa Clara	3,699	2,076	56,899	173,474	145,653	14,930	1,480	37,027	589,949	95,955	1,121,142
Santa Cruz	6,237	(D)	10,100	7,914	21,895	(D)	(D)	4,271	71,636	18,868	140,921
Solano	1,814	1,131	16,276	9,809	27,918	5,458	496	5,931	74,836	32,334	176,003
Sonoma	6,407	2,808	22,754	25,629	39,951	(D)	(D)	11,172	134,291	29,535	272,547
Primary Program Area Total	51,183	46,123	294,599	403,331	593,902	69,046	5,050	245,841	2,628,325	576,729	4,914,129
Percent of Primary Program Area Total	1.0%	0.9%	6.0%	8.2%	12.1%	1.4%	0.1%	5.0%	53.5%	11.7%	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 2006 (CA25N: Total full-time and part-time employment by NAICS industry), <http://www.bea.gov/regional/reis/CA25Nfn.cfm>

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

For the state overall, the largest employment sectors in 2006 were other services at 48.9 percent of the total, wholesale and retail trade at 14.1 percent, and government at 13.0 percent. Farm/Agriculture and Natural Resources and Mining represented, respectively, 1.2 and 1.3 percent of the total, and the smallest employment sector was utilities at 0.3 percent of total employment.¹²

B2.3.2 Unemployment

Table B-6 includes data on the size of the labor force and average annual unemployment rates in the primary and statewide Program Areas since 1990. The unemployment rate in the primary Program Area has been consistently below the national average of 5.4 percent¹³ since 1990, falling from 4.3 percent in 1990 to 3.7 percent in 2000 and rising to 4.7 percent in 2007. Unemployment in the state decreased from 5.8 percent in 1990 to 4.9 percent in 2000 and rose to 5.4 percent in 2007.¹⁴

The historical unemployment patterns vary considerably among counties in the primary Program Area. For example, the unemployment rate in San Benito and Monterey counties was more than twice the rate in other primary Program Area counties and the state from 1990 to 2007. Conversely, Marin and San Mateo counties have had the lowest unemployment rate in the primary Program Area since 1990.¹⁵

Table B-6 Unemployment in the Program Areas (1990–2008)¹

County/Area	1990		2000		2008	
	Labor Force	Unemployment Rate	Labor Force	Unemployment Rate	Labor Force	Unemployment Rate
Alameda	677,600	4.1%	768,700	3.6%	755,400	4.8%
Contra Costa	435,400	4.0%	500,700	3.5%	526,100	4.7%
Marin	131,900	2.5%	141,700	2.8%	136,100	3.7%
Monterey	172,800	9.7%	203,100	7.4%	209,200	7.2%
Napa	56,433	4.1%	66,600	3.6%	74,300	4.1%
San Benito	20,958	12.2%	27,400	6.0%	25,100	7.2%
San Francisco	409,600	3.8%	472,500	3.4%	433,300	4.3%
San Mateo	370,300	2.6%	398,000	2.9%	379,500	3.7%
Santa Barbara	192,658	4.9%	202,300	4.4%	217,500	4.4%
Santa Clara	852,800	4.0%	940,300	3.1%	855,200	4.7%
Santa Cruz	135,800	7.2%	148,300	5.1%	148,800	5.9%
Solano	164,900	4.8%	194,100	4.6%	211,800	5.4%
Sonoma	206,350	3.9%	253,100	3.4%	262,000	4.4%
Primary Program Area	3,827,500	4.3%	4,316,800	3.7%	4,234,300	4.7%
Statewide Program Area	15,168,500	5.8%	16,857,500	4.9%	18,188,100	5.4%

Source: California Employment Development Department 2007 (Industry Employment & Labor Force – by Annual Average)

¹ Annual unemployment rates are based on nonseasonally adjusted monthly unemployment data.

¹² U.S. Department of Commerce, Bureau of Economic Analysis, 2006. Total Full-Time and Part-Time Employment by NAICS Industry (Table CA25N)

¹³ U.S. Bureau of Labor Statistics. Labor Force Statistics from the Current Population Survey, Series LNU04000000. Website (<http://data.bls.gov/PDQ/servlet/SurveyOutputServlet>) accessed March 26, 2009.

¹⁴ California Employment Development Department, 2007

¹⁵ California Employment Development Department, 2007

B2.3.3 Income and Earnings

This section includes a discussion of personal income and earnings by industry for each county in the primary Program Area and state. It also includes a description of earnings by industry, a component of personal income. Earnings, in addition to employment, point out the relative income contributions of various industries in the 13-county area and state. Earnings by industry is a measure more relevant than total personal income for evaluating the potential economic impacts of the Proposed Program alternatives because the measure includes wages/salaries of employees and proprietors' (or business) income. Table B-7 shows total real personal income¹⁶ levels among counties in the primary and statewide Program Areas between 1990 and 2006.¹⁷ Total personal income in the primary Program Area in 2006 was \$451.9 billion.¹⁸ Annual income in the primary Program Area grew at a compound annual rate of 2.6 percent between 1990 and 2006. The income growth rate in the 13-county area was negative between 2000 and 2006, however. The largest percentage income declines were in Santa Clara and San Mateo counties between 1990 and 2006 (2.3 and 1.2 percent, respectively) while Santa Cruz, San Benito, Alameda, and Sonoma counties experienced declines of 1.0, 1.0, 0.2, and 0.1 percent, respectively. Personal income in San Benito and Marin counties increased at compound annual rates of 3.5 percent and 3.3 percent, respectively, between 1990 and 2006. Personal income in the state rose at a compound annual rate of 2.1 percent over that period to \$451.9 billion.¹⁹

Table B-8 presents earnings by industry in the primary Program Area and state in 2006. In the 13-county area, earnings were highest in the other services and manufacturing sectors at \$148 and \$49 billion, respectively, which accounted for 44.6 and 14.6 percent of all earnings.²⁰ Other major sectors included government, wholesale/retail trade, and finance and insurance (12.8, 9.7, and 8.2 percent, respectively). Farm-related earnings accounted for 0.6 percent of the primary Program Area total.

For the state, earnings in other services, government, and manufacturing were \$463, \$180, and \$132 billion, respectively. These 3 sectors accounted for 41.2, 16.0, and 11.7 percent, respectively, of all industry earnings within the state. The lowest earning sectors included farm/agriculture and natural resources and mining with \$7.6 billion and \$10.8 billion, respectively, accounting for 0.7 and 1.0 percent of the state totals.

Earnings by place of work in 2005 were highest in Santa Clara County (\$95.1 billion), followed by San Francisco County (\$55.2 billion). The lowest earnings were in San Benito County (\$0.9 billion), followed by Santa Cruz County (\$6.3 billion), and Solano County (\$8.3 billion).

¹⁶ Personal income is defined as the income that is received by persons from participating in production, from both government and business transfer payments, and from government interest (which is treated like a transfer payment). It is calculated as the sum of wage and salary disbursements, other labor income, proprietors' income with inventory valuation and capital consumption adjustments, rental income of persons with capital consumption adjustment, personal dividend and interest income, and transfer payments to persons, less personal contributions for social insurance (Bureau of Economic Analysis, 2006).

¹⁷ Similar to employment, historical trends in total income are presented at the county and study area level, while information on income by economic sector is presented for current (2006) conditions only.

¹⁸ Bureau of Economic Analysis, 2006b, Table CA04

¹⁹ Bureau of Economic Analysis, 2006b, Table CA04

²⁰ U.S. Department of Commerce, Bureau of Economic Analysis, 2006. Personal Income by Major Source and Earnings by NAICS Industry (Table CA05N).

Table B-7 Total Personal Income and Income Growth in Program Areas (1990–2006)^{1,2}

County/Area	Income (000 of \$2006)			Income Growth (Compound Annual Growth Rate)		
	1990	2000	2006	1990–2000	2000–2006	1990–2006
Alameda	\$49,371,184	\$71,751,466	\$70,833,251	3.8%	-0.2%	2.3%
Contra Costa	\$35,813,935	\$54,552,813	\$56,841,586	4.3%	0.7%	2.9%
Marin	\$13,525,150	\$21,562,167	\$22,624,230	4.8%	0.8%	3.3%
Monterey	\$12,187,314	\$15,557,910	\$16,645,862	2.5%	1.1%	2.0%
Napa	\$4,278,888	\$6,061,991	\$6,665,918	3.5%	1.6%	2.8%
San Benito	\$1,088,764	\$2,007,649	\$1,894,388	6.3%	-1.0%	3.5%
San Francisco	\$36,633,320	\$55,666,460	\$56,498,156	4.3%	0.2%	2.7%
San Mateo	\$32,404,973	\$53,668,762	\$50,031,367	5.2%	-1.2%	2.8%
Santa Barbara	\$13,980,734	\$16,604,592	\$18,678,282	1.7%	2.0%	1.8%
Santa Clara	\$65,036,347	\$117,530,053	\$102,430,425	6.1%	-2.3%	2.9%
Santa Cruz	\$8,340,408	\$12,879,522	\$12,091,561	4.4%	-1.0%	2.3%
Solano	\$11,099,886	\$14,086,862	\$15,294,983	2.4%	1.4%	2.0%
Sonoma	\$14,578,075	\$21,577,835	\$21,399,443	4.0%	-0.1%	2.4%
Primary Program Area	\$298,338,977	\$463,508,081	\$451,929,453	4.5%	-0.4%	2.6%
Statewide Program Area	\$1,079,510,788	\$1,419,630,370	\$1,534,076,474	2.8%	1.3%	2.2%

Source: U.S. Department of Commerce, Bureau of Economic Analysis 2006b (CA04: Personal income and employment summary)

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

² Monetary values reported in constant 2006 dollars

Note: Similar to employment, historical trends in total income are presented at the county and study area level, while information on income by economic sector is presented for current (2006) conditions only.

Table B-8 Earnings by Industry in the Program Areas (2006)*

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
Study 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
Study Area Percent	0.6	0.7	6.3	14.6	9.7	1.4	1.0	8.2	44.6	12.8	100.0
State 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
State Percent	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)

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

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

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

B2.3.4 Income-Related Measures of Social Well-Being

In 2004, per-capita personal income in the 13-county area (on a weighted average basis) was \$46,317. Across counties, per-capita income levels were highest in Marin County (\$74,035), San Francisco County (\$57,870), and San Mateo County (\$56,550).²¹ Per-capita income for the state averaged \$35,219 in 2004. Based on these figures, per capita personal income in Marin, San Francisco, San Mateo, Santa Clara, and Contra Costa counties ranked 1st, 2nd, 3rd, 4th, and 5th in the state, respectively.

Based on 2000 Census data (1999 dollars), the weighted average median household income in the primary Program Area was \$61,303, 41.1 percent higher than the statewide figure of \$47,493. Median household income at the county level was highest in Santa Clara County (\$74,335), followed by Marin County (\$71,306), San Mateo County (\$70,819), and Contra Costa County (\$63,675).²²

Poverty rates represent the percentage of an area's total population living at or below the poverty threshold established by the U.S. Census Bureau.^{23,24} Based on 2000 Census data (using 1999 income figures), the weighted poverty rate in the 13-county area was 9.2 percent, lower than the statewide rate of 14.2 percent. The poverty rate was highest in Santa Barbara County (14.3 percent), followed by Monterey County (13.9 percent), Santa Cruz County (11.9 percent), and San Francisco County (11.3 percent).

B2.4 AGRICULTURAL & HORTICULTURAL RESOURCES

This section describes the agricultural and horticultural resources that may be affected by LBAM, while **Section B1.5** addresses the economic importance of these resources. Included in this section is a discussion of organic farming, which may be particularly susceptible to LBAM infestations in light of restrictions on pest management practices, as well as a discussion on the role of beneficial insects on agricultural production. Finally, this section also provides an overview of the various programs and policies applicable to agriculture in the state.

B2.4.1 Host Crops and Plants

A wide range of plants are known to serve as hosts to LBAM, including a number of horticultural and agricultural commodities. Specific to California, CDFA has developed horticultural and agricultural host lists that identify 143 and 50 species as LBAM hosts, respectively.²⁵ 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 B-9 details the LBAM host list used in this analysis, organized into 12 different commodity groups: nursery stock, vegetables and melons, strawberries, caneberries, grapes, avocados, stone fruits, pome fruits, citrus fruits, other fruits, nut crops, and other crops.

²¹ California Department of Finance, 2006, California Statistical Abstract (Table D-9)

²² California Department of Finance, 2006, California Statistical Abstract (Table D-21)

²³ California Department of Finance, 2006, California Statistical Abstract (Table D-21)

²⁴ Poverty thresholds used by the U.S. Census Bureau vary and are based on a range of factors, including money income, size of family, and age of family members.

²⁵ http://www.cdfa.ca.gov/phpps/PDEP/target_pest_disease_profiles/LBAM_HostList.pdf

Table B-9 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, 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: California Department of Food and Agriculture, Plant Health and Pest Prevention Services, The Light Brown Apple Moth Project, Host List, Horticulture and Agriculture, http://www.cdffa.ca.gov/phpps/PDEP/target_pest_disease_profiles/LBAM_HostList.pdf accessed February 11, 2009

B2.4.2 Agricultural Production

California agricultural cropping patterns vary from year to year depending upon climatic and economic conditions. Based on county agricultural commissioner data, Table B-10 presents average annual acres in production and values for LBAM host crops in the primary Program Area during the period 2002 to 2006. Over that period, an average of approximately 702,000 acres of land was in host crop production in the primary Program Area, accounting for 12.4 percent of total host crop acreage in the state. The majority of host-crop acreage in the primary Program Area was in vegetable and melon crops, with about 437,000 acres in production (62.3 percent of the total). Other host crops with substantial acres in production in the primary Program Area include grapes (163,000 acres), other crops (42,000 acres), and strawberries (17,000 acres). These top 4 crop groups account for almost 94 percent of the total agricultural host crop acreage in the primary Program Area.

Average cropping patterns and related agricultural production values for LBAM host crops throughout the state are presented in Table B-11. Between 2002 and 2006, over 5.6 million acres of land were in host crop production, on average, with the majority of crop acreage (2.0 million acres or 32.7 percent) in vegetable and melon crops. Other prominent host crops across the state, measured by crop acreage, included other crops (1.2 million acres), nuts (932,000 acres), and grapes (830,000 acres). These top 4 crop groups account for 87 percent of the total agricultural host-crop acreage in the statewide Program Area.

Table B-10 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

^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.

Table B-11 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.

B2.4.3 Organic Farming

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. According to those standards, 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 getting official recognition by a certified USDA inspector. The inspector visits and examines the farm to ensure that all growing and handling practices follow the rules necessary to meet USDA organic standards.

The organic food industry has grown at an estimated 20 percent annual rate over the last decade, resulting from an increase in consumer demand and attractive organic price premiums.²⁶ California is the largest organic vegetable producer in the U.S., accounting for 41 percent of U.S. certified organic vegetable acreage.

Organic host crop acreages for the primary Program Area are displayed in Table B-12. The largest acreage is in vegetables. Organic vegetables account for over 20 thousand acres, 64.7 percent of all organic host-crop acreage in the primary Program Area. The next largest acreages are in organic pome fruits with 3.2 thousand acres (10.0 percent) and organic grapes with 2.8 thousand acres (8.8 percent). The smallest acreages are in organic citrus fruit with 117 acres (0.4 percent), and organic stone fruits with 291 acres (0.9 percent).

Table B-12 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 B-13). Organic vegetable host crops were on the largest number of acres at 56.7 thousand acres, or at 44.5 percent of the total. Organic grapes were the second largest host crop, at approximately 19.2 thousand acres (15.1 percent) and organic other crops were third with 12.9 thousand acres (10.1 percent). Organic host crops with the smallest acreage include caneberries at 842 acres (0.7 percent), strawberries with 1.5 thousand acres (1.4 percent), and avocados, at 3.3 thousand acres (2.7 percent).

²⁶ United States Department of Agriculture, Electronic Outlook Report from the Economic Research Service. *Price Premiums Hold on as U.S. Organic Produce Market Expands*. Oberholtzer, Dimitri, and Greene (2005)

Table B-13 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
Caneberries	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)

B2.4.4 Designated Farmland

California has 27.5 million acres of farmland. The California Department of Conservation classifies farmland based on a system that combines technical soil ratings and current land use as the basis for the different categories²⁷ (see Table B-14). “Important farmland” is divided into 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.

Table B-14 California’s Important 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: State of California, Department of Conservation. FMMP-Important Farmland Categories.

²⁷ State of California, Department of Conservation, FMMP- Important Farmland Map Categories.
http://www.conservation.ca.gov/dlrp/fmmp/mccu/Pages/map_categories.aspx

A summary of the area designated as important farmland in the primary Program Area and the state is shown in Table B-15. The primary Program Area has an estimated 1.1 million acres of important farmland. Prime Farmland accounts for 50.9 percent, (557,000 acres), Farmland of Local Importance accounts for 24.9 percent (272,000 acres), Unique Farmland accounts for 13.2 percent (144,000 acres), and Farmland of State Importance accounts for 11.1 percent (122,000 acres).

For the state overall, Prime Farmland constitutes 40.8 percent (5.1 million acres), Farmland of Local Importance represents 22.9 percent (2.9 million acres), Farmland of State importance comprises 21.6 percent (2.7 million acres), and Unique Farmland covers 10.2 percent (1.3 million acres). Overall, Important Farmland in the primary Program Area accounts for 8.8 percent of the state total.

Table B-15 Important Farmland Summary, Program Areas, 2004

Area	Prime Farmland	Farmland of Statewide Importance	Unique Farmland	Farmland of Local Importance	Important Farmland Subtotal ^a
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
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 2004
a. Important farmland subtotal for the state includes two additional values: 536,802 acres of irrigated farmland and 7,461 of nonirrigated farmland.

B2.4.5 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 if their land is located within an agricultural preserve.²⁸ 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 percent to 75 percent.²⁹ Once the agricultural land has been entered into the program it remains there for the entire 10-year term. The contract automatically

²⁸ Agricultural preserves are land the city or county designated for Williamson Act contracts. The preserve must be a minimum of 100 acres in size, but do not need to be owned by the same person.

²⁹ California Department of Conservation. *Land in the Balance: Williamson Act Costs, Benefits, and Options*, 1989.

renews each year thereafter unless a “nonrenewal” application is filed and it remains in place even if the land changes ownership. Cancellation of the Williamson Act contract before the end of the 10-year term requires board/council approval and the landowner must pay a cancellation fee equal to 12.5 percent of the unrestricted, fair market value of the property.

As of January 2005, 16 million acres of California’s farmland was enrolled in the Williamson Act and 54 out of California’s 58 counties have adopted the Act.³⁰

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 most contact 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.³¹

Agricultural land conservation acreage in the primary Program Area totals 3.1 million acres, as shown in Table B-16. Within the area, Monterey County is the greatest at 764,000 acres, followed by San Benito with 584,000 acres, and Santa Barbara with 548,000 acres. The counties within the primary Program Area with the least acres are San Francisco at 0 acres, Santa Cruz with 19,000 acres, and San Mateo with 1.4 percent 47,000 acres.

Table B-16 Agricultural Land Conservation Acreage in the Program Area, 2003

County	Williamson Act Acres	Farmland Security Zone Acres	Total ^a
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	-	-	-
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: State of California, Department of Conservation. Williamson Act Program – Report and Statistics, by County. Accessed March 2008.

a. Total Conservation acreage equals the sum of Williamson Act acres and Farmland Security Zone acres.

³⁰ All counties except Del Norte, San Francisco, Inyo, and Yuba.

³¹ California Department of Conservation. *California Land Conservation (Williamson) Act Status Report, 2006.*

B2.4.6 Beneficial Insects and Agriculture

Honeybees are reported to be essential for more than 90 food crops,³² and production of some crops requires pollination, while others do not. Dependence is highly varied. Table B-17 compares dependence on insect pollination by honeybees and values for several prominent fruit and nut, vegetable and melon, and field crops grown in California.³³ As shown, insect pollination is required for several fruits, nuts, and vegetable crops, many of these grown in the primary infestation area as well as in other parts of the state. Almonds, apples, and avocados are fully dependent on insect pollination and, in turn, require honeybees for 100 percent, 90 percent, and 90 percent of insect pollination, respectively. Among vegetables, asparagus, broccoli, carrots, and celery are fully dependent on insect pollination and on honeybees for either 80 percent or 90 percent of insect pollination. Among field crops, the requirements for insect pollination are high for alfalfa and low for cotton and sugarbeets.

Many flowers also require pollination. Honeybees act as pollinators for some of these species, but other insect and animal species can also pollinate, including wild bees, wasps, flies, beetles, bats, birds, and butterflies and moths.³⁴

The USDA estimates California has 340,000 bee colonies, down from an average of nearly 500,000 colonies in the early 1990s.³⁵ Some unquantified part of the decline is due to the increasing incidence of “Colony Collapse Disorder (CCD),” which in various areas of the continental U.S. has been reported to destroy 30 percent to 90 percent of bee colonies.³⁶ Because of CCD and possibly other factors, colony numbers nationwide fell by more than 40 percent between 1947 and 2005.³⁷ The causes for CCD are not known with certainty, but are believed to include parasitic mites, infection by bacteria and other organisms, stress caused by many different factors, and poor nutrition, either singly or in combination.³⁸

The data on agricultural crop value attributable solely to pollination are limited. Morse and Calderone³⁹ estimate the U.S. value attributable to honeybees was \$14.6 billion in 2000. The largest proportions of the total were represented by, respectively, alfalfa hay, apples, almonds, cotton, and soybeans. Table B-18 contains estimates of percent of pollination dependent on honeybees, and values for host crops in California.

³² United States Department of Agriculture, Agricultural Research Service. Insects, Bees, and Entomology. Website (http://riley.nal.usda.gov/nal_display) accessed on January 16, 2009.

³³ See Morse, Roger A., and Nicholas W. Calderone, Date (?), “The Value of Honey Bees as Pollinators of U.S. Crops in 2000,” Cornell University, Ithaca.

³⁴ U.S. Fish and Wildlife Service, Date (?), “Why Pollinators are Important,” Website (<http://www.fws.gov/Pollinators>) accessed on January 16, 2009.

³⁵ United States Department of Agriculture, National Agricultural Statistics Service, 2008, “California Bee Colonies and Honey 1944–2007,” California Field Office, Sacramento. Data refer to producers with five or more colonies.

³⁶ United States Department of Agriculture, Agricultural Research Service, Date (?), “CCD Overview,” Website (<http://www.ars.usda.gov/Services>), accessed on January 16, 2009.

³⁷ Berenbaum, May R., Professor, Department of Entomology, University of Illinois, March 29, 2007, “Subject: Problems in Domestic Bee Colonies, Statement of May R. Berenbaum before the Subcommittee on Horticulture and Organic Agriculture,” U.S. House of Representatives, Washington, D.C.

³⁸ Ibid.

³⁹ Morse, Roger A., and Nicholas W. Calderone, Date (?), “The Value of Honey Bees as Pollinators of U.S. Crops in 2000,” Cornell University, Ithaca.

Table B-17 Crops and Crop Values Dependent on Honeybees for Pollination in the Primary Program Area

Crop	Crop Values ¹ (\$)	Percent of Crop Dependent on Insect Pollination	Percent of Pollination from Honeybees	Percent of Pollination Dependent on Honeybees	Crop Values Dependent on Honeybees ¹ (\$)
Fruits & Nuts					
Almond	5,279,200	100%	100%	100%	5,279,200
Apple	19,676,700	100%	90%	90%	17,709,030
Apricot	2,982,000	70%	80%	56%	1,669,920
Avocado	2,056,000	100%	90%	90%	1,850,400
Cherry, Sweet	14,712,000	90%	90%	81%	11,916,720
Grapefruit	549,300	80%	90%	72%	395,496
Lemon	381,300	20%	10%	2%	7,626
Orange	9,728,500	30%	90%	27%	2,626,695
Grape	1,175,327,700	10%	10%	1%	11,753,277
Nectarine	319,000	60%	80%	48%	153,120
Olive	268,800	10%	10%	1%	2,688
Peach	724,800	60%	80%	48%	347,904
Plum/Prune	4,904,500	70%	90%	63%	3,089,835
Strawberry	599,482,100	20%	10%	2%	11,989,642.00
Vegetables and Melons					
Asparagus	19,131,000	100%	90%	90%	17,217,900.00
Broccoli	244,645,000	100%	90%	90%	220,180,500.00
Carrot	16,962,000	100%	90%	90%	15,265,800.00
Cauliflower	95,059,000	100%	90%	90%	85,553,100.00
Celery	117,536,000	100%	80%	80%	94,028,800.00
Cucumber	366,900	90%	90%	81%	297,189.00
Onion	45,807,600	100%	90%	90%	41,226,840.00
Pumpkin	878,400	90%	10%	9%	79,056.00
Squash	2,936,700	90%	10%	9%	264,303.00
Field Crops					
Hay	36,405,400	100%	60%	60%	21,843,240.00
Legume Seed	7,230,800	100%	90%	90%	6,507,720.00
Sunflower	5,572,400	100%	90%	90%	5,015,160.00
<i>Source:</i> Morse, Roger and Calderone, Nicholas. March 2000. The Value of Honeybees as Pollinators of U.S. Crops in 2000. Cornell University, Ithaca, NY					
¹ . Crop values are in 2006 dollars					

Table B-18 Crops and Crop Values Dependent on Honeybees for Pollination in the Statewide Program Area

Crop	Crop Values ¹ (\$)	Percent of Crop Dependent on Insect Pollination	Percent of Pollination from Honeybees	Percent of Pollination Dependent on Honeybees	Crop Values Dependent on Honey bees ¹ (\$)
Fruits & Nuts					
Almond	2,618,651,210	100%	100%	100%	2,618,651,210
Apple	113,932,640	100%	90%	90%	102,539,376
Apricot	34,489,070	70%	80%	56%	19,313,879
Avocado	341,492,170	100%	90%	90%	307,342,953
Blueberry	35,188,690	100%	90%	90%	31,669,821
Cherry, Sweet	221,404,920	90%	90%	81%	179,337,985
Citrus					
Grapefruit	66,825,120	80%	90%	72%	48,114,086
Lemon	356,040,270	20%	10%	02%	7,120,805
Lime	539,670	30%	90%	27%	145,711
Orange	1,055,665,790	30%	90%	27%	285,029,763
Tangelo	1,901,780	40%	90%	36%	684,641
Tangerine	124,928,260	50%	90%	45%	56,217,717
Grape	3,707,096,500	10%	10%	1%	37,070,965
Kiwifruit	36,728,580	90%	90%	81%	29,750,150
Macadamia	342,300	90%	90%	81%	277,263
Nectarine	272,879,770	60%	80%	48%	130,982,290
Olive	19,050,260	10%	10%	1%	190,503
Peach	482,041,850	60%	80%	48%	231,380,088
Pear	95,304,530	70%	90%	63%	60,041,854
Plum/Prune	525,826,220	70%	90%	63%	331,270,519
Strawberry	1,340,101,240	20%	10%	02%	26,802,025
Vegetables and Melons					
Asparagus	93,656,960	100%	90%	90%	84,291,264
Broccoli	545,689,220	100%	90%	90%	491,120,298
Carrot	535,363,350	100%	90%	90%	481,827,015
Cauliflower	173,251,090	100%	90%	90%	155,925,981
Celery	323,927,690	100%	80%	80%	259,142,152
Cucumber	18,975,630	90%	90%	81%	15,370,260
Cantaloupe	162,026,440	80%	90%	72%	116,659,037
Honeydew	38,237,530	80%	90%	72%	27,531,022
Onion	383,787,890	100%	90%	90%	345,409,101
Pumpkin	19,299,170	90%	10%	9%	1,736,925
Squash	23,897,360	90%	10%	9%	2,150,762
Vegetable Seed	54,927,280	100%	90%	90%	49,434,552
Watermelon	79,563,280	70%	90%	63%	50,124,866

Table B-18 Crops and Crop Values Dependent on Honeybees for Pollination in the Statewide Program Area

Crop	Crop Values ¹ (\$)	Percent of Crop Dependent on Insect Pollination	Percent of Pollination from Honeybees	Percent of Pollination Dependent on Honeybees	Crop Values Dependent on Honey bees ¹ (\$)
Field Crops					
Alfalfa, seed	22,824,310	100%	60%	60%	13,694,586
Alfalfa, hay	1,038,934,970	100%	60%	60%	623,360,982
Cotton, lint	610,996,100	20%	80%	16%	97,759,376
Cotton, seed	124,859,000	20%	80%	16%	19,977,440
Legume, seed	11,001,800	100%	90%	90%	9,901,620
Sugarbeet	66,172,070	10%	20%	2%	1,323,441
Sunflower	31,765,900	100%	90%	90%	28,589,310
<small>Source: Morse, Roger and Calderone, Nicholas. March 2000. The Value of Honeybees as Pollinators of U.S. Crops in 2000. Cornell University, Ithaca, NY</small>					
<small>¹ Crop values are in 2006 dollars</small>					

B2.5 AGRICULTURAL AND HORTICULTURAL ECONOMICS

The agricultural industry is an important part of the California economy. Not only does agricultural production provide crops for final consumption in the state and other domestic and international markets, it also generates jobs and income for thousands of workers in the farm sector, as well as agricultural-support industries. Farm production serves as important linkages to many industries, such as equipment and chemical manufacturing, food and beverage processing, financial services, textiles, and transportation. In 2003, California’s agriculture, forestry, fishing, hunting, and supporting industries accounted for about 1.5 percent of the state’s gross state product of \$1.43 trillion.⁴⁰ Similarly, the nursery industry in California plays an important role in the state’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.⁴¹ Californians are the primary consumers of nursery products and are the largest single market for lawn and garden products in the U.S.

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

B2.5.1 Agricultural Revenues and 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 Tables B-10 and B-11 and described in Section B1.5.1.1. Tables B-12 and B-13 focus specifically on organic crop values, which are described, along with the associated price premium associated with organically produced commodities, in Section B1.5.1.2.

⁴⁰ University of California, Agricultural Issues Center. 2006. *The Measure of California Agriculture*, Chapter Five, Agriculture’s Role in the Economy. Davis

⁴¹ Carman, Hoy F., and Rodriguez, Ana Maria. July 2004. Economic Contributions of the California Nursery Industry. University of California. Giannini Foundation Information Series No. 04–1

Host Crops

The average annual value of host crops produced in the primary Program Area agricultural is approximately \$6.2 billion, which accounts for 25.1 percent of total host crop value produced in the state. The highest-value host crop group in the primary Program Area is vegetable and melon crops, with an annual value of \$3.1 billion (49.7 percent of total host crop value in the area). Other high-value host crops in the primary Program Area are grapes, with a value of \$1.2 billion annually (18.9 percent); nursery stock, with an annual value of \$958.9 million (15.4 percent); and strawberries valued at \$693.3 million annually (11.1 percent). 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 value of host crop production is approximately \$24.8 billion annually. Similar to the primary Program Area, vegetables and melons have the highest value, producing about \$7.6 billion in agricultural revenues annually, which accounts for roughly 30.7 percent of the total host crop value across the state. Other high-value host crops in the state include nursery stock with \$3.8 billion in annual production value (15.4 percent); grapes with an annual value of \$3.7 billion (14.7 percent); and nut crops valued at \$3.3 billion annually (13.4 percent). These top 4 crop groups account for 74.3 percent of the total agricultural host crop value in the statewide Program Area.

Organic Host Crops

Agricultural revenues from organic production of host crops in the primary Program Area is estimated at approximately \$232.1 million annually. The value of organic vegetable crops is the highest of the crop groups, generating revenues of 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 vegetable crops, with an annual value of over \$331 million annually, or 55.1 percent of total organic host-crop value in the statewide Program Area. Organic grape crops produced the next highest level of revenues to producers, generating about \$79.2 million annually (13.2 percent of total production value), followed by organic strawberries at \$46.5 million annually (7.7 percent).

ORGANIC CROP PRICE PREMIUM

Certified organic produce generally receives a price premium, defined as the difference between organic and comparable conventional products, reflecting higher costs for additional processing, transportation, and handling requirements. An organized compilation of price data for organic products has not been completed, thereby limiting a full comparison of prices for organic commodities with conventional ones. However, several U.S. studies have examined data collected by private and nonprofit organizations for farm-level, wholesale, and retail organic prices, showing significant premiums for organic fruits, vegetables, grains, and milk.⁴² In addition, USDA has collected data on wholesale organic price premiums for major fruits and vegetables. It found, on average, organic prices were significantly higher than conventional prices, as illustrated by a number of select crops.⁴³ For example, from 1999 to 2007, organic broccoli received an average price premium of 144.1 percent relative to nonorganic varieties, carrots received a 135.3 percent price premium, and salad mix received a 10.0 percent price premium. In more recent years, from 2005 to 2007,

⁴² United States Department of Agriculture, Electronic Outlook Report from the Economic Research Service. 2005. Price Premiums Hold on as U.S. Organic Produce Market Expands. Website (<http://www.ers.usda.gov/publications/vgs/may05/vgs30801/vgs30801.pdf>) accessed April 14, 2009.

⁴³ USDA, Economic Research Service. Website (<http://www.ers.usda.gov/Data/OrganicPrices>) accessed March 17, 2009.

fruits, as a whole, received a price premium of 54.4 percent and vegetables received a 77.1 percent price premium.

B2.5.2 California Agricultural Exports, Including Nursery Products

California is the top exporter in the nation for fruits, tree nuts, and many other specialty crops.⁴⁴ In 2006, exports of California agricultural and nursery products were valued at \$9.8 billion, a record to that date.⁴⁵ 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.

While the percentage of agricultural production exported varies considerably by crop and by year, export markets are critical outlets for many California agricultural products. For example, in 2006, 96 percent of California cotton production, 72 percent of almonds, and 57 percent of pistachios were exported. Grape exports, including wines, were 27 percent of California production. Among years, the percentages vary based on production, prices, exchange rates, availability and prices of crops from other countries, and other factors. Moreover, it is reasonable to assume that export markets for many California crops support the prices of those commodities, although those parameters are and the factors affecting the proportions of crops exported each year are beyond the scope of this study.

California agricultural products were exported to more than 150 individual countries in 2006.⁴⁶ Among these, the top 10 destinations accounted for 72 percent of total 2006 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 B-19 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 2006.⁴⁷ The largest crop value among the exported crops over the period 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 terms of export 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 annual average of nearly \$1.1 billion.

⁴⁴ California Department of Food and Agriculture, Plant Health and Pest Prevention Services. Export Status of California Specialty Crops. Website (<http://www.cdfa.ca.gov/PHPPS/pe/exportstatus/index.asp>) accessed February 12, 2009.

⁴⁵ Rowhani, Omid, and Daniel A. Sumner. December 2007. California International Agricultural Exports in 2006, AIC Issues Brief Number 32. University of California Agricultural Issues Center, Davis.

⁴⁶ Rowhani, Omid, and Daniel A. Sumner. December 2007. California International Agricultural Exports in 2006, AIC Issues Brief Number 32. University of California Agricultural Issues Center, Davis.

⁴⁷ 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.

Table B-19 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
<i>Source: University of California, Agricultural Issues Center. Various years. California International Agricultural Exports</i>			

Corresponding figures for California are displayed in Table B-20. The host crops with greatest export values were nut crops at \$2.0 billion, grapes at \$1.4 billion, and vegetable and melons with \$1.0 billion. On average, approximately 23.6 percent of total host crops were exported from the state, at an annual average of over \$5.8 billion.

Table B-20 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
<i>Source: University of California, Agricultural Issues Center. Various years. California International Agricultural Exports</i>			

B2.5.3 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 direct benefits at the farm level. 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, which are based on inter-industry linkages with the agricultural sector. These linkages are frequently quantified by the use of input-output models, discussed in greater detail in Section B3.3.7, and account for the indirect and induced effects emanating from the direct effects at the farm level. Table B-21 presents the regional economic impacts of current agricultural production of LBAM host crops in the primary and statewide Program Areas.

Table B-21 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
¹ Based on agricultural production of LBAM host crops during the period 2002 to 2006
² Values reported in thousands 2009 dollars

In the primary Program Area, the direct output (or value) of existing host crop production is estimated to be approximately \$6.4 billion annually. This level of agricultural production indirectly generated 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 were 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.

B2.6 REGULATORY ENVIRONMENT

When LBAM was discovered in California in 2007, an emergency was declared that placed all counties with LBAM detection under quarantine. The quarantine program is designed to safeguard U.S. agriculture and natural resources from the introduction, establishment, and spread of plant pests and noxious weeds.⁴⁸

The state mandated quarantine places tight restrictions on the interstate movement of nursery stock or greenery of any plants, trees, or bushes⁴⁹ located within the 13 quarantined counties.⁵⁰ The quarantine does allow for the movement of the host crop items so long as specific control measures are followed. To be

⁴⁸ United States Department of Agriculture, APHIS, Plant Health, http://www.aphis.usda.gov/plant_health/index.shtml (accessed January 2009)

⁴⁹ Includes all green waste and green hay

⁵⁰ The quarantine also applies to any farm or facility within 1.5 miles of a LBAM detection site.

eligible for shipment from within the quarantined areas, trapping for LBAM must occur on each premises or farm⁵¹ 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; and shipment of articles intended for interstate movement must be inspected by an inspector and a certificate⁵² issued for interstate movement only if the articles are found free of any life stages of LBAM. To be eligible for interstate movement under certificate, nursery stock, cut flowers, greenery of any plants, trees and bushes, greenwaste, and green hay, located more than 1.5 miles from an LBAM detection in any of the quarantined counties trapping for LBAM must occur on each farm that ships regulated articles interstate. 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 CDFA to ensure compliance with the above two conditions.

To be eligible for shipment from within the quarantined area fruits, vegetables and bulk fresh herbs and spices growing in any of the quarantined counties areas must trap 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.

⁵¹ 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.

⁵² 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.

Environmental Impacts and Mitigation Measures

This section describes the physical and economic impacts of the Program alternatives on agricultural and horticulture resources. The criteria used to assess impacts and the methodology implicit to the analysis are presented below. The analysis addresses both direct and indirect impacts, and is 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 CDFA, where applicable.

B3.1 EVALUATION CONCERNS AND CRITERIA

This section evaluates both physical effects on agricultural resources, as well as related economic effects associated with changes in agricultural production and practices. According to the California Environmental Quality Act Guidelines, economic or social information may be included in an Environmental Impact Report (§15131). However, such effects should not be treated as significant effects on the environment, although an Environmental Impact Report may trace the chain of cause and effect from economic to environmental impacts focusing on the resultant physical change in the environment (§15131(a)). In the context of the Proposed Program, the economic effects 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 effects can be used to determine significance of environmental impacts (§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, as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to nonagricultural use?
- 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 the California Environmental Quality Act, 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.

B3.2 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 CDFA (see Dowell 2008)⁵³ and serve as part of the basis for changes in agricultural production costs. Further, it is assumed that, even in the context of individual farm-level response to potential LBAM infestation, LBAM would not be completely eradicated, and as a result, LBAM would continue to spread statewide and some level of residual crop damage would occur. Conversely, under the Program alternatives, 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.

B3.2.1 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. Further, this impact considers farm-level management responses to LBAM infestations, including increased pesticide use.

B3.2.2 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.⁵⁴ 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.⁵⁵ 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 larva 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 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

⁵³ CDFA, 2008, "A Partial Analysis of the Potential Increase in Pesticide Use Light Brown Apple Moth Might Cause in Commercial Agriculture and Uncultivated Settings in California," prepared by Robert V. Dowell, Ph.D., Director Light Brown Apple Moth Eradication Program, October 13, 2008

⁵⁴ United States Department of Agriculture, Animal and Plant Health Inspection Service. May 2, 2007. Federal Domestic Quarantine Order, *Epiphyas postvittana* (Light Brown Apple Moth), DA 2007-42.

⁵⁵ California Department of Food and Agriculture. March 10, 2009. Plant Quarantine Manual. Section 3434. Light Brown Apple Moth. Sacramento.

inspections following treatment reveal no further larvae. Treatment and inspections may require 3 or more weeks.⁵⁶

In addition to domestic intrastate and interstate quarantines, farmers and nursery operators in infested areas are subject to import restrictions of foreign importers. These 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.⁵⁷ In addition, China and South Korea have inquired about the LBAM Program.⁵⁸

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, which may reduce severely the available markets for those crops. For this impact topic, 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.

B3.2.3 Effects on Farm-Level Production Costs

Financial impacts to farmers and nursery operators are tied directly to production costs and sale revenues 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.

B3.2.4 Effects on Organic Farming

Organic farms in the study area 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 harvested 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 those realized for organically produced crops. This effect, by necessity, was evaluated qualitatively.

B3.2.5 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 adverse 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 in assessing the potential impacts on crop production of LBAM control. As noted previously, the impacts are primarily qualitative rather than quantitative because of data limitations.

⁵⁶ Roach, Bob, Office of Monterey County Agricultural Commissioner. March 26, 2009. Personal communication.

⁵⁷ See, e.g., Canadian Food Inspection Agency. January 25, 2008. D-07-03: Plant Protection (Phytosanitary) Import Requirements to Prevent the Entry of *Epiphyas postvittana* (Walker) (Light brown apple moth). Website (<http://www.inspection.gc.ca/english/plaveg/protect/dir/d-07-03e.shtml>) accessed April 1, 2009; and California Department of Food and Agriculture. March 25, 2008. Phytosanitary Advisory No. 05-2008, Update – Mexican Certification Requirements for Light Brown Apple Moth Host Materials. Sacramento.

⁵⁸ APHIS and California Department of Food and Agriculture. January 2, 2009. Weekly Situation Report: Light Brown Apple Moth (LBAM). Sacramento.

B3.2.6 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 extensive numbers of farm workers who depend 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 occur under the various alternatives. To estimate these effects, a set of regional economic impact models were 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 (jobs).

B3.3 NO PROGRAM

B3.3.1 Effects on Agricultural Production and Land Uses

LBAM is of particular concern because it has the potential to damage a wide range of agricultural crops and nursery plants, as evidenced by historic damage that has occurred in Australia and New Zealand. On agricultural crops, LBAM affects 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.⁵⁹ Economic impacts attributed to crop damage and related losses in agricultural revenues under the No Program Alternative are addressed in Section B2.3.2. In addition, LBAM infestation may affect the ability of producers to ship their commodities based on quarantine restrictions, which is addressed in Section B2.3.3. Finally, producers are expected to experience an increase in production costs associated with increased pesticide use in an effort to meet quarantine requirements; this impact is presented in Section B2.3.4.

Each of the economic factors referenced above, individually and collectively, has the potential to affect agricultural production and land uses 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 all together. 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 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. The conversion of agricultural land to nonagricultural uses may occur on Designated Farmland and these nonagricultural uses could conflict with agricultural zoning or Williamson Act contract. This is a potentially significant impact.

⁵⁹ The State of Victoria, Department of Primary Industries, Pests and Diseases, Light Brown Apple Moth in Orchards, <http://www.dpi.vic.gov.au/dpi/nreninf.nsf/childdocs/-71E8091F577D52D24A2568B30004F3B2-07E8C65C31CFC12CCA256BC80002930B-38E0071A086D6D434A256DEA00274A2B-D0BF8390831C66F5CA256C190007EFC9?open> accessed February 10, 2009

B3.3.2 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.⁶⁰

The level of potential host crop damage attributed to LBAM is difficult to ascertain. Several studies have been published on crop damages based on case studies in Australia and New Zealand; however, no published studies are known of crop damages resulting from LBAM in California or in the U.S. Due to the lack of area-specific data, this analysis uses crop damage estimates obtained from an economic analysis published by the USDA, which uses estimates of crop damages from LBAM infestations in Australia.⁶¹ The USDA analysis calculated crop damages based on damages experienced in Australia for selected crops (i.e., grapes, oranges, apples, and pears), applied to the annual value of similar crops in the U.S. This analysis uses a similar approach, except that the range of overall damage coefficients was applied across the four crops considered in the USDA study and 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 percent 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 B-22. 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 B-22 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

⁶⁰ Personal communication between Bob Roach (Monterey County Agricultural Commissioner) and Steve Pavich (ENTRIX) on April 3, 2009.

⁶¹ United States Department of Agriculture, Animal and Plant Health Inspection Service, *Economic Analysis: Risks to U.S. Apple, Grape, Orange, and Pear Production from the Light Brown Apple Moth, Epiphyas postvittana (Walker)*, November, 2007.

Crop damage estimates within the statewide Program Area are shown in Table B-23. Across the state, potential crop damages are substantial, ranging from \$49.7 million to \$620.8 million annually. Similar to the primary Program Area, estimated crop losses are highest on vegetables and melons, with estimated crop damages of \$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 B-23 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, 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 is a potentially significant impact.

B3.3.3 Effects on Agricultural and Horticultural Trade and Exports

The agricultural and horticultural industry in California relies on the ability to ship a range of 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 would 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 target 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 will sell can be determined.

Under the No Program Alternative, the continued presence of LBAM in the primary Program Area would not have an adverse impact on the volume of exports relative to existing conditions where quarantine regulations already exist because it is assumed that producers would meet treatment and inspection requirements to ship their commodities. In other areas in the state, 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.

B3.3.4 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.

Dowell⁶² 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.

Acreages of Host Crops

The analysis herein utilizes the application rates in Dowell’s paper, usually specified as low and high rates. The classification of acreages differs somewhat from Dowell’s paper because the primary Program Area used in this analysis does not match the coastal counties used by Dowell. However, the state total acreages are consistent between the two analyses.

Acreages of other host crops were taken from the summaries, of county agricultural commissioner reports, prepared by the National Agricultural Statistics Service.⁶³ These included several groups of vegetables, nuts, unspecified fruits, corn, alfalfa, and nursery commodities. The crops and crop groups used, including those in the Dowell report, are shown in Table B-24.

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.

⁶² Dowell, Robert. October 13, 2008. A Partial Analysis of the Potential Increase in Pesticide Use Light Brown Apple Moth Might Cause in Commercial Agriculture and Uncultivated Settings in California. California Department of Food and Agriculture. Sacramento.

⁶³ See http://www.nass.usda.gov/Statistics_by_State/California/Publications/AgComm/indexcac.asp. For this analysis, data from 2006 were used for consistency with those reported in the Dowell report.

Table B-24 Crops and Crop Groups Utilized to Estimate Increased Pesticide Usage for LBAM Control Under the No Program Alternative

Crop/Crop Group	Acreage		
	Primary Program Area	Rest of State	State Total
Grapes	171,548	645,477	871,025
Citrus	2,871	264,162	267,033
Pome fruits	6,395	11,326	17,721
Stone fruits	3,832	249,858	253,690
Kiwi fruit		3,732	3,732
Caneberries	2,570	3,864	6,434
Strawberries	18,978	16,856	35,834
Almonds	2,106	640,555	642,661
Avocado	8,828	55,352	64,180
Artichokes	7,473	1,191	8,664
Asparagus	3,254	19,293	22,547
Beans	7,151	8,920	16,071
Broccoli and similar	80,540	46,488	127,028
Carrots and similar	50,607	107,707	158,314
Corn	332	653,624	653,956
Fruits and nuts, unspecified	2,199	19,928	22,127
Alfalfa	42,398	1,128,348	1,170,746
Mint		3,958	3,958
Lettuce and similar	207,088	147,861	354,949
Peas	2,746	774	3,520
Potatoes		59,079	59,079
Spinach and similar	34,271	18,458	52,729
Cucurbits	15,194	80,111	81,705
Tomatoes and similar	47,839	397,778	445,617
Nuts and similar	10,351	366,746	377,097
Nurseries	7,798	34,936	42,734
Total	736,369	4,986,382	5,759,631

Nursery acreage is reported in some, but not all, county agricultural commissioner reports. Because many nurseries are likely to be treated under the No Program Alternative, it was necessary to estimate total nursery acreage for the primary Program Area and for the state overall. Total statewide acreage was developed using information from the Cdfa Agricultural Resource Directory⁶⁴ and the agricultural commissioner crop report for San Diego County.⁶⁵ The former states that San Diego County has 18 percent of the state total for nursery products and 51 percent of the state total for flowers and foliage. The San Diego County report states that the county has 6,503 acres of nursery products and 3,369 acres of flowers and foliage. Using the percentages

⁶⁴ California Department of Food and Agriculture. Date (?). California Agricultural Resource Directory. Sacramento, p. 32.

⁶⁵ San Diego County Department of Agriculture, Weights, and Measures. Date (?). 2007 Crop Statistics and Annual Report. San Diego, p. 5.

from the CDFA report and the acreages from the San Diego County report, total state nursery acreage is estimated as 42,734 acres.⁶⁶

Estimated Quantities of Pesticides Used on Host Crops

The Dowell paper includes ranges of pesticide application rates for each crop or crop group discussed. In some cases, more than one pesticide is referenced, and the resulting pounds of active ingredient are implicitly identical in their efficacy in controlling LBAM. In other cases, some pesticides referenced in the Dowell report are not included because price data could not be found for the products. For crops not included in the Dowell report, information on appropriate pesticides and application rates was taken from the California Department of Pesticide Regulation website,⁶⁷ labels of the individual products,⁶⁸ and information sheets from the University of California Statewide Integrated Pest Management Program.⁶⁹ The information is summarized in Table B-25. Unit prices for pesticides are also included.

Table B-25 Pesticide Unit Prices and Ranges of Pesticide Application Rates, by Product and Host Crop*

Crop/Group	Application Rate per Acre					
	PE (oz)	CRY (lbs)	INT (oz)	ENT (oz)	Btk (lbs)	LO (qts)
Unit Price	\$1.03	\$3.08	\$2.97	\$34.06	\$15.32	\$14.94
Grapes		6-8	10-16	1.25-2.5		
Citrus		8-20			0.5-2.0	1-2
Pome fruit			16	2-3	0.5-2.0	
Stone fruit			8-16	1.71-2.50	0.5-2.0	
Kiwi fruit		6-8			0.5-2.0	
Caneberries				2-3	0.5-2.0	
Strawberries			6-12	1.25-1.5	0.5-2.0	
Almonds			32	1.25-3.0	0.5-2.0	
Avocado					0.5-2.0	
Artichoke	6.4-19.2			1.5-3.0		
Asparagus						1
Beans	4-8			1-2		
Broccoli/similar	4-8			1-2		
Carrots/similar	4-8			1-2		
Corn				0.7		
Fruits, nuts unspecified				1.25-3.0	0.5-2.0	
Alfalfa	6					
Mint						0.9
Lettuce/similar			4-8	1-2		
Peas				1.4	0.8	
Potatoes				9.5		

⁶⁶ That is, $(6,503/0.81) + (3,369/0.51) = 42,734$.

⁶⁷ See <http://www.cdpr.ca.gov>.

⁶⁸ See, e.g., the label for Intrepid at <http://www.dowagro.com/ca/prod/intrepid240f.htm>.

⁶⁹ See <http://www.ipm.ucdavis.edu>.

Table B-25 Pesticide Unit Prices and Ranges of Pesticide Application Rates, by Product and Host Crop*

Crop/Group	Application Rate per Acre					
	PE (oz)	CRY (lbs)	INT (oz)	ENT (oz)	Btk (lbs)	LO (qts)
Spinach/similar	2.7			1.6		
Cucurbits			4-10	1.25-2.50		
Tomatoes/similar				9.5		
Nuts/similar				1.25-3.00	0.5-2.0	
Nurseries						0.4

*PE = Permethrin; CRY = Cryolite; INT = Intrepid; ENT = Entrust; Btk = *Bacillus thuringiensis*; LO = Lorsban

Estimated Total Costs of Pesticides Used on Host Crops

Annual farm and nursery pesticide costs for the No Program Alternative are shown in Table B-26. The figures are estimated using the figures shown in Table B-25 and the assumption, following Dowell’s report, that 5 percent and 2.5 percent, respectively, of the coastal and noncoastal host crop land will be treated. 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. Thus, e.g., while pome fruits could be treated at *Bacillus thuringiensis kurstaki*, Intrepid, or Entrust, it is assumed that Entrust, the highest cost pesticide, would be used.

As shown in Table B-26, 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 B-26 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

Table B-26 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
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 is a potentially significant impact.

B3.3.5 Effects on Organic Farming

Organic farms in both the primary and statewide Program Areas may be affected by the presence of LBAM itself and related crop damages or by the measures used to control it. If LBAM is not treated, organic farmers may suffer crop damages and losses, which are summarized in Section B2.3.2. Under the No Program Alternative, organic farmers are expected to take measures to protect crops from pest damage and reduce quarantine effects. Organic operations have several options that are in compliance 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. USDA's National Organic Program Standards require organic farms to have clearly defined buffers and boundaries between organic and nonorganic farms to address the issue of potential pesticide drift. Despite these measures, if pesticide drift were to occur, the contaminated organic crops would not be able to be sold or labeled as "organic" and would therefore lose its 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 effects on the organic industry is higher than under existing conditions. This is a potentially significant impact.

B3.3.6 Effects on Beneficial Insects and Agriculture

Under the No Program Alternative, control of LBAM 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. In turn, the potential exists for reduced crop pollination and subsequent declines in crop yields. 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 (Reidl et al. 2006) and crop yields could decline, a potentially significant impact.**

B3.3.7 Regional Economic Effects on Agricultural Support Industries

The economic effects described above, namely 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, which result as money is circulated throughout the economy from 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 capture indirect and induced effects.

Table B-27 presents the range 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, these damages 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 normal until crop damages occur. These direct losses in agricultural revenues were input into the economic model as reductions in household income (accounting for taxes and savings),⁷⁰ 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 economic model estimates 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. Lastly, reduction in agricultural income is expected to generate employment losses totaling -68 to -851 jobs.

⁷⁰ In the primary Program Area, the disposable income rate is 71.2 percent of household income.

Table B-27 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 Damage ³						
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 impacts.						
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 and helping to 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 to the economic model accounting for the assumed proportion of local pesticide manufacturing. The model estimates that 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. In the context of labor income, 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.

Table B-28 presents the results of the regional economic analysis for the statewide Program Area following the same approach as described above. In the context of crop damages, the 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.

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 are \$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.

Table B-28 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 impacts. ³ Based on estimated crop damages from LBAM infestation under the No Program Alternative						

Under the No Program Alternative, the direct economic effects 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 is a potentially significant impact.

B3.4 MATING DISRUPTION ALTERNATIVE (MD)

B3.4.1 Twist Ties, Alternative MD-1

Effects on Agricultural Production and Land Uses

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 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 to occur 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. In fact, 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, no impact would occur.

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 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, 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 would occur relative to existing conditions.

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 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 the ecological risk assessment presented in 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 are anticipated.

B3.4.2 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 under all of the Program alternatives; refer to Section B2.4.1.1.

Effects on Agricultural Revenues (Crop Damages)

Anticipated effects on agricultural revenues associated with crop damages to LBAM host commodities would be comparable under all of the Program alternatives; refer to Section B2.4.1.2.

Effects on Agricultural Trade and Exports

Anticipated effects on agricultural trade and exports would be comparable under all of the Program alternatives; refer to **Section B2.4.1.3.**

Effects on Farm-Level Production Costs

Anticipated effects on farm-level production costs would be comparable under all of the Program alternatives; refer to **Section B2.4.1.4.**

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

The ecological risk assessment 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 under all of the Program alternatives; refer to Section B2.4.1.7.

B3.4.3 Aerial Applications, 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 under all of the Program alternatives; refer to **Section B2.4.1.1**.

Effects on Agricultural Revenues (Crop Damages)

Anticipated effects on agricultural revenues associated with crop damages to LBAM host commodities would be comparable under all of the Program alternatives; refer to Section B2.4.1.2.

Effects on Agricultural Trade and Exports

Anticipated effects on agricultural trade and exports would be comparable under all of the Program alternatives; refer to Section B2.4.1.3.

Effects on Farm-Level Production Costs

Anticipated effects on farm-level production costs would be comparable under all of the Program alternatives; refer to **Section B2.4.1.4**.

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 (CCOF),⁷¹ 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

⁷¹ The CCOF certifies to the [USDA National Organic Program](#) standards and is one of the oldest and largest organic certification and trade associations in North America.

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-1; refer to Section B2.4.1.6.

Regional Economic Effects on Agricultural Support Industries

Assuming successful eradication, anticipated effects on regional economic conditions would be comparable under all of the Program alternatives; refer to Section B2.4.1.7.

B3.5 MALE MOTH ATTRACTANT ALTERNATIVE (MMA)

Alternative MMA involves ground treatment with LBAM-specific pheromones plus permethrin to attract and kill male moths. Alternative MMA is conducted in advance of the aerial mating disruption (if needed) to enhance the efficacy of the aerial mating disruption pheromone applications. The treatment area consists of a 1.5-mile radius around any detection site and may occur on 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 B3.2.2.

Effects on Agricultural Production and Land Uses

Anticipated effects on agricultural and land uses would be comparable under all of the Program alternatives; refer to Section B2.4.1.1.

Effects on Agricultural Revenues (Crop Damages)

Anticipated effects on agricultural revenues associated with crop damages to LBAM host commodities would be comparable under all of the Program alternatives; refer to Section B2.4.1.2.

Effects on Agricultural Trade and Exports

Anticipated effects on agricultural trade and exports would be comparable under all of the Program alternatives; refer to Section B2.4.1.3.

Effects on Farm-Level Production Costs

Anticipated effects on farm-level production costs would be comparable under all of the Program alternatives; refer to Section B2.4.1.4.

Effects on Organic Farming

Alternative MMA involves the integrated use of pheromones and permethrin. 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.⁷² 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 those 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 prohibitive 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.

Effects on Beneficial Insects and Agriculture

According to the U.S. Environmental Protection Agency (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 2006).

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 are expected to be less than significant. Mitigation is not required.

Regional Economic Effects on Agricultural Support Industries

Assuming successful eradication, anticipated effects on regional economic conditions would be comparable under all of the Program alternatives; refer to Section B2.4.1.7.

⁷² California Certified Organic Farmers Manual Two: USDA National Organic Program Standards 7 CFR Part 205, Section 205.672 Emergency Pest or Disease Treatment, 2007

B3.6 ORGANICALLY APPROVED INSECTICIDES ALTERNATIVE (Btk AND S)

Alternatives Btk and S include pesticidal control use of *Bacillus thuringiensis kurstaki* (Alternative Btk) and spinosad (Alternative S). 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.

Effects on Agricultural Production and Land Uses

Anticipated effects on agricultural and land uses would be comparable under all of the Program alternatives; refer to **Section B2.4.1.1**.

Effects on Agricultural Revenues (Crop Damages)

Anticipated effects on agricultural revenues associated with crop damages to LBAM host commodities would be comparable under all of the Program alternatives; refer to Section B2.4.1.2.

Effects on Agricultural Trade and Exports

Anticipated effects on agricultural trade and exports would be comparable under all of the Program alternatives; refer to Section B2.4.1.3.

Effects on Farm-Level Production Costs

Anticipated effects on farm-level production costs would be comparable under all of the Program alternatives; refer to Section B2.4.1.4.

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 PRO (Btk) and Entrust® (spinosad).

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

Effects on Beneficial Insects and Agriculture

Applications of Btk and spinosad pose potential risks on beneficial insects, specifically lepidopteron species including butterflies (USEPA 2002). 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. No mitigation is required.

Regional Economic Effects on Agricultural Support Industries

Assuming successful eradication, anticipated effects on regional economic conditions would be comparable under all of the Program alternatives; refer to Section B2.4.1.7.

B3.7 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.

Effects on Agricultural Production and Land Uses

Anticipated effects on agricultural and land uses would be comparable under all of the Program alternatives; refer to Section B2.4.1.1.

Effects on Agricultural Revenues (Crop Damages)

Anticipated effects on agricultural revenues associated with crop damages to LBAM host commodities would be comparable under all of the Program alternatives; refer to Section B2.4.1.2.

Effects on Agricultural Trade and Exports

Anticipated effects on agricultural trade and exports would be comparable under all of the Program alternatives; refer to Section B2.4.1.3.

Effects on Farm-Level Production Costs

Anticipated effects on farm-level production costs would be comparable under all of the Program alternatives; refer to Section B2.4.1.4.

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.

Effects on Beneficial Insects and Agriculture

Anticipated effects on beneficial insects would be comparable to Alternative MD-1; refer to Section B2.4.1.6.

Regional Economic Effects on Agricultural Support Industries

Assuming successful eradication, anticipated effects on regional economic conditions would be comparable under all of the Program alternatives; refer to Section B2.4.1.7.

B3.8 STERILE INSECT TECHNIQUE ALTERNATIVE (SIT)

Effects on Agricultural Production and Land Uses

Anticipated effects on agricultural and land uses would be comparable under all of the Program alternatives; refer to Section B2.4.1.1.

Effects on Agricultural Revenues (Crop Damages)

Anticipated effects on agricultural revenues associated with crop damages to LBAM host commodities would be comparable under all of the Program alternatives; refer to Section B2.4.1.2.

Effects on Agricultural Trade and Exports

Anticipated effects on agricultural trade and exports would be comparable under all of the Program alternatives; refer to Section B2.4.1.3.

Effects on Farm-Level Production Costs

Anticipated effects on farm-level production costs would be comparable under all of the Program alternatives; refer to Section B2.4.1.4.

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.

Effects on Beneficial Insects and Agriculture

Anticipated effects on beneficial insects would be comparable to Alternative MD-1; refer to Section B2.4.1.6.

Regional Economic Effects on Agricultural Support Industries

Assuming successful eradication, anticipated effects on regional economic conditions would be comparable under all of the Program alternatives; refer to Section B2.4.1.7.

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