CHAPTER 14

Cumulative Impacts

"Cumulative impacts" are defined as "two or more individual effects which, when considered together, are considerable or compound or increase other environmental impacts (CEQA Guidelines Section 15355). Previously approved projects will be part of the baseline, and future projects that are not now known are speculative and need not be considered in the analysis. However, the analysis does need to consider the impacts of the proposed project in combination with any other reasonably foreseeable projects, and all of those impacts must be considered against the environmental baseline.

The cumulative impact from several projects is the change in the environment that results from the incremental impact of the project when added to other closely related past, present, and reasonably foreseeable probable future projects. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time. The question is whether the project's incremental effect is cumulatively considerable. For a project to have a cumulative impact, it must have some incremental impact in the category being studied. For example, if the cumulative projects will all have impacts on Swainson's hawk, but the proposed project will not have any incremental impact on Swainson's hawk, the project has no cumulative impacts on Swainson's hawk. Conversely, if the project will have a large enough significant impact, such that it may affect an entire watershed or air basin, it may be considered to have significant cumulative impacts even if no other projects will contribute impacts. The determination is whether the proposed project's incremental contribution to a cumulative impact results in a potentially "considerable" (i.e., significant) cumulative impact, and, if so, whether the project's incremental contribution can be mitigated to a less-than-significant level.

The concern then is to assess the incremental environmental impact that can occur from a variety of sources, a summation of multiple insignificant impacts that, when taken together, result in a significant impact. If so, then the project's incremental contribution to the combined significant cumulative impact is "cumulatively considerable." In summary, only the less-than-significant and potentially significant impacts of the LBAM Eradication Program alternatives have the potential to add an incremental effect to a cumulatively significant impact.

CEQA Guidelines Section 15064 (h) (4) states that the mere existence of significant cumulative impacts caused by other projects alone shall not constitute substantial evidence that the proposed project's incremental effects are cumulatively considerable. Where cumulative impacts are significant, any level of incremental contribution to that impact by the proposed project does not have to be called out as cumulatively considerable. Furthermore, when the LBAM Program makes no incremental contribution at all to a significant cumulative impact caused by other plans, programs, and projects, i.e., the "no impact" determination for a Program alternative, it cannot be called cumulatively considerable.

Two methods exist for analyzing the cumulative impacts of past, present, and reasonably foreseeable future projects: the "list method" and the "summary of projections method" (CEQA Guidelines Section 15130). Both of these methods are most appropriate to the evaluation of land development or projects involving changes in land use and related activities.

- The list method requires a discussion of related past, present, and future projects; and in the case of human health, it would require discovering and disclosing impacts to public health from all of these projects. This approach is not practical given the LBAM Program's nearly statewide extent of the LBAM Program, which makes the development of a list of projects most difficult and would then require a

human health impact assessment for a very long list and variety of projects potentially creating a physical change in the environment.

- The summary of projections method relies on projections contained in approved land use documents such as general plans, specific plans, and local coastal plans to serve as the foundation for the cumulative analysis. The issue is whether the project under evaluation is consistent with the forecasts of economic and population growth contained in the planning documents and, therefore, already addressed in the certified EIRs on these plans and projects. Can the agency rely on the cumulative analyses addressed in a prior EIR to say that no further analysis is needed?

The listing of all of the projects occurring in an area is not practical for this evaluation of a Program that could occur over a large part of the state of California. The LBAM Program would not result in additional housing or commercial/industrial development in a treatment area. The alternative "summary of projections" method is also not practical because it is based on summaries of growth in city and county plans, which are not relevant for the Program as it does not induce growth or develop land. Because the Program Area is large, the impacts are explained in the context of a statewide or regional environmental concern, and the analysis includes consideration of statewide trends in pesticide use 2002–2007 where appropriate as an alternative to the growth projections contained in local general plans.

The following discussion of cumulative impacts is for resources and environmental concerns with less-than-significant or potentially significant impacts and the geographic scope of the analysis is either the state or a subset of counties within the state (13- to 16-county area where trapping and eradication activities are underway). A summary of the cumulative impact determinations is presented at the end of the chapter by the affected resource.

14.1 AGRICULTURAL/HORTICULTURAL RESOURCES AND ECONOMICS

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

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

In the context of organic farming, potential impacts associated with pesticide applications near organic farming operations are expected to be temporary, Program-specific, and mitigable to less than significant, rather than cumulatively considerable. For example, some farmers could temporarily lose their organic certifications due to permethrin use under Alternative MMA if it were to contaminate soil, but because these impacts are not only short term but can be avoided entirely with the selection of treatment sites away from organic farming operations, it is not considered a cumulatively considerable impact. Similarly, any disruption to pollinators/honeybees and pollination would be highly localized to the treatment area and temporary, lasting only during the eradication period; therefore, from a cumulative perspective the impact would be less than significant. Moreover, in the case of both impacts, no known past, present, and reasonably foreseeable "actions" in the Program Area are adversely affecting organic agriculture or agriculturally beneficial insects with one exception. The decline in honeybees from Colony Collapse Disorder is not fully understood and may be due to a combination of factors including diseases, pesticides, and migratory beekeeping. Therefore, the LBAM Program's less-than-significant, incremental impacts would not contribute considerably to impacts to organic farming and beneficial insects important to agricultural and horticultural resources.

14.2 URBAN AND RURAL LAND USES

No potentially significant or even less-than-significant incremental impacts to urban and rural land uses would occur as a result of any of the Program alternatives. Therefore, no cumulative impacts would occur. The Program would not create any barriers that would divide established communities, and the evaluation of compatibility of the Program with applicable land management regulations resulted in no impacts. The Program's effects would not result in a significant contribution to cumulative land use impacts associated with forest land management for wildfire prevention.

The Program would not result in permanent or temporary changes to land uses. Of statewide concern is the conversion of agricultural land to urban uses, and this issue is addressed in Section 14.1, Agricultural/Horticultural Resources and Economics. The Program would not contribute to land conversion from agricultural to urban uses or to loss of forestry resources.

14.3 NOISE

The Program's application of chemical and nonchemical treatments using ground-based and aerial equipment would have either potentially significant or less-than-significant impacts due to exceedance of state noise guidelines or substantial temporary noise increases above ambient noise levels. All noise impacts can be mitigated to less than significant. None of the impacts are permanent or long term. Nonpermanent noise sources still must comply with noise regulations that pertain to specific areas within the Program Area, although some local ordinances and regulations exempt government-controlled operations considered critical or an emergency, or when the authoritative agency is the same or a higher branch of government.

Noise generated by Program eradication activities could have cumulative impacts on a small percentage of the population that is particularly susceptible to noise. Due to the statistical size of the population, even the higher noise levels permitted by law could also affect the same or smaller subset of the population as well. The Program's incremental contribution to the cumulative noise impact in a community (where noise comes from many sources) on sensitive receptors is potentially cumulatively considerable. Such cumulative impacts are considered significant but can be mitigated to less than significant through avoidance of applications near sensitive receptors and with the implementation of noise-reducing measures.

14.4 AIR QUALITY

Impacts to air quality from all of the Program alternatives are less than significant. The cumulative impacts due to the criteria pollutant emissions are discussed in this section. The majority of air districts assume that if project-level emissions do not exceed significance thresholds, and no closely related project exists, then a project would not have a cumulatively considerable impact on air quality. In most of the areas likely to be treated for LBAM infestations, related projects would be those to control mosquitoes (by special districts) and to control gypsy moths by the CDFA. These projects would not occur at the same time (day) and same location. All of the Program alternative emissions would be below the significance thresholds for criteria pollutant emissions. The incremental impacts on air quality from the LBAM Program are not individually significant nor are they cumulatively considerable. Therefore, cumulative impacts to air quality are less than significant.

14.5 PUBLIC SERVICES AND HAZARD RESPONSE

The LBAM Program would not increase demand for police, fire, or health-care services, nor would it create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials, through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment, or through the operation of aircraft. In addition, the Program would not expose people or structures to a significant risk of loss, injury, or death involving wildland fires. In short, the Program does not have incremental impacts on public services, and implementation of any of the Program alternatives (individually or in combination) would not result in a significant contribution to any cumulative public services and hazard response impacts that could result from other projects in the vicinity of the treatment areas.

14.6 HUMAN HEALTH

A summary of the level of significance of the Program's predicted effects from chemical treatments on human receptor populations is presented in Table 8-50 (Section 8.2.9). The following sections contain a discussion of whether these impacts could become cumulatively considerable. The discussion of cumulative impacts addresses human health concerns where no impacts, less-than-significant impacts after mitigation, or potentially significant impacts occur. The usual approach to a cumulative analysis is to consider health impacts from all of the projects occurring in an affected area; however, this approach is not practical for the present evaluation given the Program's statewide extent. Human health concerns addressed in this analysis focus solely on effects of pesticide use, in that potential health effects of Program uses of pesticides provided the framework for the Human Health Risk Assessment (Appendix D) and, therefore, also serve as the basis for understanding any potential cumulative health-related impacts. Only the potentially significant and less-than-significant impacts of the Program alternatives have the potential to add an incremental effect to a cumulatively significant impact. The discussion of "no impacts to human health" and No Program are for informational purposes only.

14.6.1 No Impacts

Two of the four categories of Program alternatives, Alternative MD (MD-1, MD-2, and MD-3) and the Organically Approved Insecticides (Alternatives Btk and S), would not adversely affect the health of any of the human receptor populations evaluated in the HHRA (Tables 8-15 through 8-35 [Alternative MD] and Tables 8-43 through 8-49 [Organically Approved Insecticides]). This determination was based on either (1) HQs or HIs that were below the health-effects threshold of 1, or (2) if HQs or HIs could not be calculated because of a lack of appropriate toxicity criteria (e.g., RfDs), toxicity data were considered in conjunction with exposure estimates (intakes) to support the conclusion that exposures would be below levels likely to be of concern to human health. Because no human health impacts were identified in association with the

chemical and biological pesticides evaluated under Alternatives MD, Btk, and S, the Program makes no incremental contribution to any pre-existing cumulative impacts. The Program's additional use of 3,300 pounds per year of Btk and 128 pounds per year of spinosad is not cumulatively considerable.

14.6.2 Impacts Less Than Significant After Mitigation

This analysis considers whether potential exists for any incremental contribution of projected Program chemical use that, when combined with other reasonably foreseeable uses of specific pesticide(s), would result in cumulative impacts that could be considered "cumulatively considerable" to human health.

Program alternative impacts were identified as "less than significant after mitigation" if the impact was first identified as "potentially significant but mitigable" on the basis of a noncancer HQ or HI that exceeded the threshold of 1, or a cancer risk that exceeded $1x10^{-6}$, and the finding of significance was coupled to one or more implementable mitigation measures. The resulting impact was deemed less than significant after mitigation.

Male Moth Attractant (Alternative MMA)

Although it is primarily a pheromone treatment (SPLAT), Alternative MMA incorporates a low dosage of the pesticide permethrin, and the inert ingredients ethylbenzene and 1,2,4-trimethylbenzene. Moths would be attracted to the pheromone (used as a bait), and be killed subsequent to contact exposure with permethrin.

Prior to applying mitigation measures, the analyses of human health effects under this alternative yielded estimates of cancer risk above $1x10^{-6}$ for all receptor populations except the Agricultural Workers. These risk estimates are significant but mitigable, based on a significance threshold of $1x10^{-6}$. Estimates of noncancer health effects did not exceed HQs of 1 for any exposure pathway (all receptors), and did not exceed chronic HIs of 1 when considering all exposure pathways (all receptors). Alternative MMA was found to have less-than-significant impacts after mitigation (see Section 8.2.1.1).

The use of permethrin associated with Alternative MMA is limited, and after implementing mitigation measures, permethrin is expected to be only minimally available for direct contact by human receptors. At issue here, however, is whether the additional use of permethrin under Alternative MMA would incrementally contribute to a cumulatively significant impact within the state, resulting in an increase in risk over the "less than significant after mitigation" Program use alone. To examine this possibility, the use of permethrin within the state was determined. That usage, based on pesticide sales from 2002 to 2007, was fairly constant between 2002 and 2005, ranging from roughly 428,000 to 484,000 pounds purchased per year. Consumption based on sales increased precipitously to approximately 605,000 pounds, but dropped similarly precipitously to roughly 355,000 pounds in 2007, the last year of records reviewed (Table 8-51). The average use of permethrin over the time period reviewed, 470,967 pounds, lies within the range seen between 2002 and 2005. The reduced demand in 2007 may simply reflect oversupply from purchases made in 2006.

The use of permethrin with Alternative MMA represents a selective use of permethrin that is not anticipated to be replicated by other programs. Therefore, the potential for cumulative impacts from its use with Alternative MMA is more related to the use of permethrin by users in the private sector. Alternative MMA offers only limited potential for an incremental increase in permethrin use that could be cumulatively considerable as a result of elevating permethrin use above the environmental baseline contained in Table 8-51 (Section 8.2.9.2). Based on projected applications under Alternative MMA, where 12 crews would be working 240 days per year, using application rates as identified in Table 2.5 of Appendix C, the CDFA estimates the incremental annual usage of permethrin to be 2,970 pounds. This increase in use is well within the variation of sales under the environmental baseline (as a projection of use) identified in Table 8-51. No increase in the use of permethrin by other programs is reasonably foreseeable, and the impacts are not concluded to be cumulatively significant.

14.6.3 Potentially Significant Impacts

This section addresses the potential for cumulatively considerable impacts under the No Program Alternative. Impacts from the No Program Alternative were generally identified as "Potentially Significant" if HQs or HIs exceeded 1 or if cancer risks exceeded $1x10^{-6}$. Findings of potentially significant impacts were reached for all receptor populations evaluated. All receptor populations (with the exception of Agricultural Workers) had potentially significant impacts attributable to both cancer risk (permethrin) and noncancer effects (chlorpyrifos and lambda-cyhalothrin). These impacts are unavoidable.

No Program Alternative

Both commercial and residential utilization of No Program chemicals was identified as a potential strategy for LBAM control, should none of the Program alternatives be implemented. Under the impacts analysis described in Section 8.2., the use of individual chemicals in this alternative was determined to represent potentially significant impacts (Table 8-50). Under the No Program Alternative, LBAM eradication would be extremely unlikely. Accordingly, pesticide use has the potential to increase as crop damage increases with the expected growth in LBAM populations over time, in the absence of other use restrictions that might be placed on currently approved chemicals. Only three of the several conventional pesticides approved for use in nurseries and host crops (DPR 2009a) were evaluated in this PEIR to be representative of other pesticides approved for use against LBAM. The use of other pesticides that would also be effective for LBAM control (e.g., carbaryl, dimethoate, methoxyfenozide, phosmet, etc.) could increase as well. Under the No Program Alternative, the two organically approved pesticides (Btk and spinosad), which are also considered under the Program's Organically Approved Insecticides (Alternatives Btk and S), would likely increase.

The selection of which approved pesticide might be used is up to the consumer, and predicting chemical-specific usage at a statewide scale is not possible. Furthermore, a cumulative effects analysis of the No Program Alternative is not required under law because the CEQA lead agency (CDFA) will not have control over nonagency-administered control programs. However, some prediction of effects of the No Program Alternative is provided for consideration.

Using permethrin as a surrogate for all insecticides that could be used, Dowell (2008b) estimated that homeowner use in 9 of the currently infested northern California counties could increase between 281 and 2,353 pounds. When considering the full 16-county area where trapping or eradication efforts have been initiated, an increase between 20,364 and 74,305 pounds of permethrin was considered possible. These estimates were based on (1) an estimate of single-family dwellings in the overall treatment area from Census Bureau statistics, (2) an estimate of the number of these houses that might apply insecticide (3 to 7 percent), and (3) an assumption that those houses that treat would only do so once a year. These input variables were applied to yield the estimates of increased use (i.e., increase use [pounds] = no. residences x 1 gallon spray/residence/year x 0.0106 or 0.024 pounds permethrin per spray event). Similarly, Dowell (2008a) estimates an annual increase in use from 600 to 4,800 pounds of Bt (1.4 to 10.5 percent), and 1,900 to 3,800 pounds of spinosad, in the *absence* of the implementation of Program alternatives.

In addition to the projected increase in use, as discussed above, all of the nonorganic, conventional No Program pesticides evaluated in this PEIR have been identified in environmental monitoring programs in the State of California. Organophosphate use, such as chlorpyrifos, has been decreasing. However, seven water bodies of California have been placed on the Section 303d list due to chlorpyrifos as part of the final 1998 Section 303(d) (Clean Water Act) list of impaired water bodies in California (DPR 2006a). As a result of the Section 303(d) listings and other legal actions, four Total Maximum Daily Loads for chlorpyrifos have been initiated in California.

Overall, the trend is towards reduced pesticide use in California. One way to characterize pesticide utilization trends in California is through DPR annual sales reports. DPR tracks the pesticides sold throughout the state on an annual basis. In 2006, 190 million pounds of pesticide and herbicide were used, including organically

approved pesticides. This usage represented a reduction of nearly 6 million pounds over what was used in 2005. Most of this reduction was attributed to a 24 percent decrease in the use of sulphur, an organically approved fungicide. In 2006, statewide insecticide use decreased by 10 percent in pounds of active ingredient and by 3 percent measured as acres treated, compared to 2005. This decrease was accompanied by a 5 percent increase of acres harvested. The decrease in acres treated with insecticides was mainly associated with the decreased uses of chlorpyrifos (-19 percent), methomyl (-42 percent), and carbofuran (-35 percent) (DPR 2005, 2006a, 2007a). In 2007, 1,806,444 pounds of chlorpyrifos, 85,771 pounds of lambda-cyhalothrin, and 354,808 pounds of permethrin were sold (DPR 2007a). By comparison, in 2006, 2,516,048 pounds of chlorpyrifos, 54,754 pounds of lambda-cyhalothrin, and 605,304 pounds of permethrin were sold (DPR 2006a). While amounts sold do not translate directly to the amounts used, these data suggest reductions in use of chlorpyrifos may be occurring statewide. While organophosphate sales appear to be declining most recently (Table 8-51), the use of pyrethroid-based insecticides appears to be holding relatively steady when considering a longer period of record. For some members of this class of compounds (lambda-cyhalothrin), use is increasing.

Environmental monitoring provides additional information about the potential for cumulative impacts from pesticide use. While environmental monitoring data cannot be translated into direct estimates of human exposure, they provide further information on pesticide usage patterns and insights into the relative persistence of certain chemicals. Where detections of specific pesticides are common, the potential for cumulatively considerable impacts from incremental uses may be considered more likely if the chemical in question is toxic and if potential exists for exposure. In a relatively recent study, Bacey et al. (2004) sampled for permethrin and related pyrethroids (e.g., lambda-cyhalothrin) and organophosphates in water and sediment samples from the Sacramento and San Joaquin watersheds collected after storm events. Permethrin and/or esfenvalerate were detected in 7 of 40 whole water samples, with concentrations measured up to 0.094 ppb. Review of these data showed that permethrin was only detected in one sample, and the majority of pyrethroid detections were for esfenvalerate. Lambda-cyhalothrin was apparently not analyzed in water samples, but was analyzed in sediment and was not detected. In contrast, trace amounts of chlorpyrifos were identified most consistently among the three No Program pesticides evaluated. The continued use of these pesticides is foreseeable throughout the state and could increase in the absence of the implementation of Program alternatives, and monitoring data suggest their persistence and/or mobility in the environment. As conclusions on cumulative impacts typically are not evaluated under CEQA for a No Program Alternative, none is offered here. Consequently, no conclusion regarding the cumulative impacts of the No Project Alternative has been reached, but the qualitative information given above is nonetheless provided for consideration.

14.7 AQUATIC RESOURCES

The less-than-significant impacts to food supply for fish under some Program alternatives would not contribute to any decline in fisheries throughout the Program Area. The most significant cumulative impacts to fishery resources in the state from various activities statewide are those associated with Pelagic Organism Decline (POD) and the recent collapse of Central Valley salmonid populations.

The LBAM Program would not contribute substantially to these fisheries issues. The only alternative expected to have any potential for cumulative effects would be Alternative MMA. Under this alternative, the pesticide permethrin would be used, in conjunction with pheromones, to attract and then kill male LBAMs. Permethrin is highly toxic to aquatic organisms. However, this treatment would be applied in very localized areas, using a technique that would minimize drift, is rainfast, and would eliminate contaminated runoff associated with the treatment from the application areas. Thus, Alternative MMA would not contribute in any substantial way to the cumulative impacts from other factors or other project activities affecting fishery resources. Additional information is provided below.

14.7.1 Pelagic Organism Decline

POD refers to the recent (2002–present) steep decline of pelagic fishes (i.e., fish that occupy open-water habitats) within the Bay-Delta estuary (Armor et al. 2005; DWR and CDFG 2007; Sommer 2007). This environmental issue has emerged as one of overwhelming concern in the Delta.

The issues surrounding POD were announced in early 2005 as a possible change in the estuary's ability to support pelagic species and appeared to be a "step-change" from the preceding long-term decline. Four fish species are of primary concern: delta smelt, longfin smelt, young-of-year striped bass, and threadfin shad. From 2002 to 2007, despite moderate hydrologic conditions in the estuary, which would have been expected to result in moderate increases in population sizes, the populations of these species experienced sharp declines. Populations of each of the four species have been at or near all-time record lows since 2002. This change has persisted for a sufficiently long period to conclude that it is the result of something other than the pattern of widely variable population levels observed historically or as part of the long-term decline previously observed.

The POD Management Team has hypothesized that the three factors most likely to be responsible for the decline are the effects of exotic species, toxins (including pesticides, ammonia, and other chemicals), and water operations (DWR and CDFG 2007). The individual importance of these three potential factors is still an unresolved question.

Many of the Interagency Ecological Program studies to evaluate POD's causes have focused on these factors. To date, research has failed to identify a single factor responsible for the decline of all species or even that of a single species (DWR and CDFG 2007; Sommer 2007). POD researchers currently believe that important factors responsible for the decline may be different for each species and that even for a single species these factors may differ between seasons and by hydrologic condition (Wet and Dry years). These factors may operate cumulatively to cause the observed population declines.

14.7.2 Salmonid Population Trends

The four runs of Chinook salmon: fall, late-fall, winter, and spring, as well as Central Valley steelhead, have all experienced long-term declines over the past several decades. Within the past decade some stocks have declined while others have stabilized or even improved, creating a complex current situation in regards to Central Valley salmonids. The heavy influence of hatchery stocks among all of these runs further complicates the overall assessment of current species status. Fall-run returns have improved over the past decade but the population has become heavily dependant on hatchery production, leaving managers uncertain of the overall sustainability of wild populations (Williams 2006). The late-fall run is included in the Central Valley fall-run Evolutionarily Significant Unit and has received very little attention in terms of research and monitoring. As a result, the population trajectory of this run, and the factors governing it, remains unclear (Williams 2006). The winter-run remains a small population with limited habitat downstream of Keswick Dam. The population has grown in recent years but remains far from recovery (Williams 2006). Spring-run populations in Sacramento River tributary streams such as Butte Creek have grown in recent years while stocks in the mainstem Sacramento River have declined (NMFS 2005; Williams 2006). Overall, the spring-run has shown broad fluctuations in abundance (NMFS 2005). Wild steelhead stocks in the Central Valley are mostly confined to the upper Sacramento River and its tributaries with other much smaller populations in the lower Sacramento and San Joaquin basins. Data on Central Valley steelhead are limited but the Distinct Population Segment is thought to be highly fragmented and suffering a continued decline corresponding with declining habitat conditions throughout the Central Valley (NMFS 2005).

While the long-term trend has been increasing, the 2007 Central Valley fall-run totaled only 90,400 fish, the lowest count since 1973 and below the Pacific Fishery Management Council's minimum conservation target of 122,000 fish (Lindley et al. 2009). In 2008, an estimated 66,000 adults returned, and in 2009 the estimated

returns for the Central Valley fall-run Chinook is projected to just meet the conservation target of 122,000 without any fishing. As a result of these poor returns, commercial fishing was closed and recreational fishing was substantially curtailed in 2008 and 2009. The cause of these low numbers has been attributed to poor ocean conditions in 2004 and 2005, on top of steady, long-term degradation of freshwater and estuarine habitats (Lindley et al. 2009).

Treatment for LBAM near aquatic environments could disturb aquatic species, which would be a less-than-significant impact unless the disturbance was to spawning behavior for anadromous salmonids, which is a potentially significant impact. This impact can be avoided with proper mitigation to avoid stream disturbance. Because the decline in salmonid populations is from many sources and multiple causes and is a significant cumulative impact from multiple watersheds, and the Program's incremental contribution is less than significant with mitigation, the Program's incremental impact is not cumulatively considerable.

14.8 TERRESTRIAL RESOURCES

Cumulative impacts are those based on two or more individual effects that in the aggregate are considerable or that enlarge or intensify other environmental impacts. For this PEIR, cumulative impacts relate to the effects of Program alternatives together with the effects of past, present, and reasonably foreseeable actions on the terrestrial biological resources considered herein: botanical resources, nontarget invertebrates and pollinators, and terrestrial vertebrate wildlife.

Less-than-significant impacts to nontarget wildlife from the LBAM mating disruption treatments are expected because the pheromone is selective to LBAM and other leafroller moths. If any native leafroller species are impacted, they would recover quickly through immigration from adjacent populations. These small incremental impacts are not cumulatively considerable, as they do not contribute to a combined significant cumulative impact from other general pest control activities by residential, commercial, and agricultural activities occurring within the treatment areas.

The use of male moth attractant treatments containing permethrin is expected to have less-than-significant impacts to other biological resources, because the treatments are specially formulated to attract LBAM and then kill them, i.e., targeted to LBAM. Only those nontarget insects that incidentally come into contact with the treatment would be affected by the permethrin. Similarly, terrestrial vertebrate wildlife exposure to permethrin and inert ingredients would be incidental. Based on the rate of permethrin use for the proposed treatments in the immediate Program Area, the additional permethrin use (less than 3,000 pounds/year) would amount to less than 1 percent of current use (354,800 pounds in 2007). See also Sections 8.3 and 12.3 for further discussion of pesticide use. Cumulative impacts to nontarget species would not be significant, and the Program is not expected to result in cumulatively considerable impacts to pollinators and honeybees.

Applications of organically approved pesticides (Btk and spinosad) would be used in relatively small areas. Populations of nontarget insects that may be reduced by these applications are expected to quickly return to pre-treatment levels through immigration from adjacent populations. Cumulative impacts to nontarget species would not occur.

The Program alternative that includes the release of parasitic wasps could result in increased predation on special-status moths and butterflies if the wasps are released near these resources. Because parasitic wasps would be used only in relatively small areas, they would not be released near areas of known threatened or endangered butterflies or moths, and *Trichogramma* populations would not remain high indefinitely, cumulative impacts to nontarget species would not occur.

Program alternatives that include truck or aerial spraying could result in an increase in ambient noise near sensitive biological receptors, such as nesting raptors. However, the increase in noise levels would be short term and would only occur during the eradication period. It is also assumed under the Program alternatives

that individual farmers and nursery operators would not contribute to ambient noise levels by applying pesticide materials to control LBAM independently. Because neither other pest control programs nor farmer and nursery operator pesticide usage for LBAM would occur under the Program, cumulative impacts would not occur.

Program alternatives that include aerial spraying or sterile moth release could result in short-term and temporary noise-level increases near sensitive receptors, such as nesting eagles or other special-status raptors, if LBAM infestations occur nearby. Potential impacts from aerial applications would be mitigated by adoption of Mitigation Measures TR-17a-c, and cumulative impacts would not occur.

14.9 WATER RESOURCES

Except for Alternative MMA, application of Program chemicals and biological agents would not adversely affect water resources nor would these alternatives exceed any thresholds or water quality regulations. Because no impacts were identified in association with these other chemical and nonchemical Program alternatives, no cumulative impacts would occur.

For Alternative MMA, mitigation would effectively preclude the potentially significant impact from overspray that could impact surface or groundwater water quality. It is not anticipated that the LBAM Program would combine with other projects or activities within the Program Area to contribute to regional water resource impacts, and Program implementation would not cause added impairments to existing impaired water bodies of the Program Area. Consequently, the residual impacts of Alternative MMA would not be cumulatively considerable in the regions where this treatment could occur.

14.10 ECOLOGICAL HEALTH

Cumulative impacts, as they relate to ecological health, includes past, present, and reasonably foreseeable actions that potentially impact terrestrial mammalian and avian wildlife, herptiles, aquatic organisms, nontarget invertebrates and pollinators, and botanical resources. Cumulative impacts can result from individually minor, but collectively significant, projects taking place over a period of time. The determination is whether the proposed project's incremental contribution to a cumulative impact results in a potentially "considerable" (i.e., significant) cumulative impact, and, if so, whether the project's incremental contribution can be mitigated to a less-than-significant level.

A summary of the level of significance of the individual Program actions on ecological receptors and pathways is presented in Table 12-11 (Section 12.3). The following is a discussion of how these impacts could become cumulatively considerable through compound utilization or accumulation in the environment. To make this determination, consideration is given to the combined contribution of Program impacts considered together with impacts that exist outside of the Program. If those impacts, taken all together using a 'summary of projections method,' result in a significant impact, then the Program's incremental contribution to the combined significant cumulative impact is "cumulatively considerable." Because the Program Area is large, the impacts are explained in the context of a statewide or regional environmental concern. The analysis focuses on projections of pesticide use. In summary, only the Program alternatives' less-than-significant and potentially significant impacts have the potential to add an incremental effect to a cumulatively significant impact. The discussions of "no impacts to ecological health" and impacts from the No Program Alternative are provided for information purposes only.

14.10.1 No Impacts

For a number of pathways Program chemicals and biological agents would not adversely affect ecological heath (Table 12-11, Section 12.2.11). This determination was based on exposure modeling that did not indicate environmental exposures would exceed screening criteria or water quality regulations, and background information was sufficient to support this conclusion for the groups of species (guilds) modeled. Because no impacts were identified in association with these chemical and nonchemical treatment alternatives, the Program makes no incremental contributions to any pre-existing cumulative impacts.

14.10.2 Less-Than-Significant Impacts

This analysis considers whether potential exists for any incremental contribution of chemical use from the LBAM Program, when combined with other reasonably foreseeable uses of the specific pesticides considered here, which would result in cumulative impacts that could be considered "cumulatively considerable" to ecological health. Program alternative impacts were identified as "less than significant" if:

- An individual HQ exceedance only marginally exceeded 1.0 for an exposure route to an ecological receptor modeled, but the method of application indicated no significant effect was likely because exposure could be considered likely incomplete or of such short duration (in keeping with the Program's eradication parameters) as to not justify a potentially significant impact to ecological health,
- HQs were below the level of concern of 1.0, but significant toxicity data gaps creating uncertainty suggested a 'no impact' conclusion was not fully supported, or
- The incorporation of mitigation measures (Program alternatives only) reduced an impact from "potentially significant impact" to a "less-than-significant impact."

The following discussion considers utilization parameters and environmental persistence characteristics of the relevant Program alternative chemicals in the environment for the less-than-significant impacts for alternatives that could contribute incrementally to a cumulative significant impact (Table 12-11).

No Program Alternative

A less-than-significant impact was concluded for No Program impacts through inhalation exposure to wildlife, and for the potential for a spill to contaminate groundwater or other environmental media (Table 12-11). The less-than-significant conclusion for inhalation was based on a data gap for avian inhalation effects; no impact via inhalation exposure was suggested from evaluating mammalian wildlife risk. The foreseeable use of No Program chemicals that would lead to an incremental increase in their use and, hence, inhalation exposure does not support a conclusion of cumulatively considerable impacts, as usage statewide in these chemicals has been generally declining (see Table 12-12, Section 12.2.11, based on pesticide sales data). The use of lambda-cyhalothrin, however, increased significantly in 2007 over previous years. Notwithstanding, the collective use of these chemicals has shown a decline. As conclusions on cumulative impact typically are not evaluated under CEQA for a No Program Alternative, none is offered here.

Projecting the cumulative impacts in the event of a spill from reasonably foreseeable programs that would use the No Program chemicals is not possible with existing information. Any spill could be assumed to have localized impacts if effective cleanup actions were not implemented. Spill pollution prevention plans are not part of the No Program Alternative, and cannot be assumed except where applications are made by registered pesticide applicators. Qualitatively, an incremental increase in spills from private landowners and homeowners could create cumulative impacts that are cumulatively considerable, but they would be dependent on the nature, location, amount spilled, and response actions exercised. As conclusions on cumulative impacts typically are not evaluated under CEQA for a No Program Alternative, none is offered

here. Consequently, no conclusion regarding the cumulative impacts of the No Project Alternative has been reached, but the qualitative information given above is nonetheless provided for consideration.

Mating Disruption (Alternative MD)

Although Alternatives MD-1, MD-2, and MD-3 use a pheromone treatment, as opposed to broad spectrum insecticides, exceedances for ecological receptors still occurred based on established screening criteria. According to HQ modeling, the only nontarget ecological receptors that would be potentially impacted by application of pheromones are nontarget terrestrial invertebrates.

Honeybee pollination is essential to modern agriculture and the services rendered by bee colonies are estimated to provide $15 billion in value to agricultural crops nationally (USDA 2007). The California almond crop alone uses 1.3 million colonies of bees during pollination, and this use alone represents roughly one-half of all the honeybees used for this purpose. The LBAM Program must be considered for its potential impacts on these important insects, particularly in light of the severe incidence of Colony Collapse Syndrome throughout the United States (Upton et al. 2008; USDA 2007). To address this concern, toxicity studies were conducted with the microencapsulated CheckMate formulation of LBAM (Monheit et al. 2008). The exposure study was two-fold, involving both contact exposure trials and feeding trials to the honeybee. Contact exposure tested groups of 30 bees with 0.12 mL of either 1x or 10x the field dose of Suterra CheckMate LBAM-F product, with associated wet and dry control groups (10 replicates each). The feeding trials provided two caps (one with 62.6 mL 50 percent sucrose solution and 70.0 grams MegaBee and another with 1.0 percent LBAM-F formulation added) to groups of bees in a side-by-side preference test (10 replicates each). Mortality was calculated for each exposure test. The results indicated that mortality in the controls was not statistically different from mortality in pheromone (active ingredient) or LBAM-F formulation trials. Although it was noted that bees consistently chose (3:1) the MegaBee diet without LBAM-F added, further evidence was provided that bees would be unlikely to collect or ingest CheckMate microcapsules while foraging. The authors commented that, in the contact exposure trials, the bees were exposed to 2,170 times more contamination than would be expected in the field. They indicated that no toxicity to honeybees would be expected from application of pheromone treatments of LBAM-F. In summary, no significant mortality or adverse effects were elicited in the honeybee at environmental concentrations of LBAM pheromone well in excess of what would be administered under Alternative MD options. Notably, this formulation was considered to present the highest potential risk of any of the LBAM formulas initially considered because of the microencapsulated formulation.

Conversely, lepidopterans (moths and butterflies) could be impacted as a result of Program pheromone applications under Alternative MD, based on past trapping data, which resulted in some native moths exhibiting a small level of attraction to LBAM pheromones (Dowell 2007). The species attracted were members of the Pyralidae and Torticidae families, and included *Achyra occidentalis* (Pyralidae), and *Henricus umbrabasanus, Archips argyrospilus, Slepsis peritana, Clepsis fucana,* and *Argyrotaenia franciscana* (Torticidae). One of the components of the LBAM pheromone is used commercially for control of the omnivorous leafroller, *Platynoa stultana*, an exotic leafroller. All of the above moth species have broad distribution throughout the state, with minimum recorded distribution in 12 counties (*Clepsis fucana*) and maximum distribution in 40 counties (*Archips argyrospilus*). Dowell (2007) noted that these distributions are considered generally accurate, but not necessarily complete.

Based on their widespread distribution within the Program Area, native lepidopterans would be present in the treatment areas during application of pheromones under Alternative MD. The impacts on these species would be less than significant because of the short-term nature of the Program action, and the widespread distribution of these species that would afford rapid recolonization even if mating of isolated populations were somewhat disrupted by treatment. Given that the use of the LBAM pheromone under Alternative MD represents a new use of the pesticide within the state (i.e., no historical or existing use outside the Program), that treatments are not expressly toxic but rather function as mating disruptors, and that trapping data captured

few individuals of these species, the incremental environmental effects associated with the use of the LBAM pheromone under Alternative MD do not result in cumulatively considerable impacts.

Male Moth Attractant (Alternative MMA)

Although it is primarily a pheromone treatment, Alternative MMA incorporates a low dosage of the pesticide permethrin and other inert ingredients. Moths would be attracted to the pheromone, intoxicated by permethrin through contact exposure, and die. Impacts at the Program level were considered less than significant for nontarget insects and special-status species. Per the discussion under Alternative MD, the use of the LBAM pheromone is limited to the Program proposed by the CDFA, and no incremental increase in LBAM pheromone use is foreseeable from other programs that would lead to an impact regarded as cumulatively significant. Consequently, the incremental impact of the pheromone ingredient is not cumulatively considerable.

The use of permethrin associated with Alternative MMA is extremely limited, and is largely isolated from environmental media and transport by the method of application in a sticky matrix (SPLAT/LBAM) on utility poles at heights of 8 feet above ground. As discussed under the No Program Alternative (Section 2.3.1), permethrin is approved for use for crops and ornamentals, and its use likely would increase under the No Program Alternative. At issue here, however, is whether the additional use of permethrin under Alternative MMA would incrementally contribute to a cumulatively significant impact within the state, resulting in a perceived increase in risk over the "less-than-significant" Program use alone. To this end, the use of permethrin within the state, based on pesticide sales from 2002 to 2007, was fairly constant between 2002 and 2005, ranging from roughly 428,000 to 484,000 pounds purchased per year. Consumption based on sales increased precipitously to approximately 605,000 pounds in 2006, but dropped similarly precipitously to roughly 355,000 pounds in 2007, the last year of records reviewed (Table 12-12). The average use of permethrin over the whole time period reviewed, 470,967 pounds, lies within the range seen between 2002 and 2005. The reduced demand in 2007 may simply reflect oversupply from purchases made in 2006.

The use of permethrin with Alternative MMA represents a selective use of permethrin that is not anticipated to be engaged by other programs. Based on projected applications under Alternative MMA, where 12 crews would be working 240 days per year, using application rates as identified in Table 2-5 of Appendix C, Alternative MMA offers limited potential for incremental increase in permethrin use that could be cumulatively considerable. The CDFA estimates the incremental usage of permethrin to be 2,970 pounds (Dowell 2008a). This increase in use is well within the variation of sales under the environmental baseline, as a projection of use as identified in Table 12-12. The use of this pesticide:pheromone combination in California is limited to the LBAM Program, and no other uses are known at this time. The alternative is selective to the LBAM species, and the method of application is highly localized to minimize potential exposure to nontarget insects and special-status insects. The impacts of the short-term use of permethrin associated with Alternative MMA were, therefore, considered less than significant for nontarget insects and special-status (insect) species. Because the increase in permethrin use under Alternative MMA is well within the summary of projections of use by other programs and private users, the Program's incremental contribution to the cumulative condition is not significant. Therefore, the Program does not have any cumulatively considerable impacts.

In addition to the No Program Alternative pesticide use, a potentially significant but mitigable impact was identified from the use of permethrin in Alternative MMA, with the potential for exceeding water quality goals associated with the spraying of this formulation, and the assumption of localized drift and dilution into nearby water. Given that the mitigation would preclude use near water, the significance of the impact was reduced to less than significant. In any case, the use of permethrin under Alternative MMA is predicated on its combination with SPLAT-LBAM to target the LBAM specifically. The use of this pesticide:pheromone combination in California is, therefore, limited to the LBAM Program, and no other uses are known at this time. The impacts of the pesticide associated with the Program are less than significant after mitigation.

Because no other uses of the pesticide would contribute to cumulative impacts on water quality goals, the Program impacts are not significant and the Program's incremental contribution to the cumulative condition is not significant. Therefore, the Program does not have any cumulatively considerable impacts.

Organically Approved Insecticides (Alternatives Btk and S)

The Organically Approved Insecticides Alternative considers the ground application use of Btk and/or spinosad to control isolated LBAM populations where aerial treatment under Alternative MD is not possible or approved. Twist ties (Alternative MD-1) may be used in conjunction with Alternatives Btk and/or S if needed.

As discussed under Section 14.10.3 below, the use of both Btk and spinosad would be expected to increase under the No Program Alternative. Under Alternatives Btk and S, however, cumulative impacts must be evaluated relative to those associated with the baseline use of these insecticides to determine whether the incremental environmental impacts resulting from the Program could be considered cumulatively considerable. The baseline for Btk and spinosad use is reflected, to some degree, in the sales of these agents, as summarized in Table 12-12. This baseline would be considered to apply to the estimated incremental increase in use of Btk or spinosad under the assumption that Program alternatives would be implemented to eradicate LBAM. Sales for Btk peaked in 2003 and 2004, exceeding 2.7 million pounds, and have remained somewhat constant over the final 3 years of monitoring reflected in Table 12-12 (225,871 to 275,485 pounds). Sales for spinosad have been more regular, ranging from 82,520 to 101,999 pounds between the years of 2003 and 2007 (Table 12-12). Spinosad sales over the final 3 years of record were over 10,000 pounds greater on average than the preceding 3 years.

At the Program level, impacts from the use of Btk and spinosad were considered less than significant for nontarget insects. HQs exceeded 1.0 to nontarget insects, but impacts were considered less than significant because long-term impacts were not considered to be significant based on the short-term length of the Program, the rapid potency degradation of these compounds in the environment, and the presumption of rapid recolonization from the infrequent applications. Although total use of Btk or spinosad for all potential application scenarios cannot be ascertained from readily available data, use of these organically approved pesticides is assumed under other programs (e.g., gypsy moth and mosquito control).

Based on the typical use of Btk and spinosad over the past 6 years of sales records available (Table 12-12), it is unlikely that usage of these insecticides under Alternatives Btk and S would yield an incremental increase in use over the environmental baseline use of these compounds. Based on projected applications under the Organically Approved Insecticide Alternative, where 12 crews would be working 240 days per year, using application rates as identified in Table 2.5 of Appendix C, approximately 3,300 pounds of Btk and 128 pounds of spinosad are anticipated to be used under the LBAM Program. This increase in use is well within the variation of sales under the environmental baseline (as a projection of use) identified in Table 12-12. Furthermore, these compounds readily degrade and have not been recognized as a concern in environmental sampling. It is concluded that the use of Btk and/or spinosad (Alternatives Btk and S) is not anticipated to result in impacts that would be considered cumulatively considerable for nontarget insects and pollinators.

Under Alternatives Btk and S a significant but mitigable impact was also identified for the “potential to involve the use, production, or disposal of materials that pose a hazard to special-status species population(s) in the Program Area” criterion (Table 12-11). The highest potential Program impacts from Alternatives Btk and S are related to nontarget terrestrial invertebrates (especially the Kern primrose sphinx moth). Because special-status species habitats or “hotspots” will be avoided, the Program impacts after this mitigation were considered less than significant. Under the presumption that other reasonably foreseeable programs would assert similar protection methods for these species, that the mitigation proposed under Alternatives Btk and S is fully implemented, and that usage patterns would not result in an incremental increase in Btk or spinosad above the variation documented in the environmental baseline of sales from the most recent years for all uses

(Table 12-12), a reasonably foreseeable incremental increase in the use of Btk or spinosad that could affect special-status insect species is not anticipated to result in impacts that would be considered cumulatively significant.

14.10.3 Potentially Significant Impacts

This section addresses the potential for cumulatively considerable impacts under the No Program Alternative. Impacts at the No Program scale were generally identified as "potentially significant" if toxicity reference value exceedances occurred for ecological receptors from anticipated exposure, and life-history characteristics of the ecological receptor(s) yielded uncertainty with respect to the long-term effects from exposure (e.g., through environmental persistence), or if projected environmental concentrations exceeded established criteria for the media. Except in one instance under Alternative MMA, all scenarios that would result in a "potentially significant" impact occurred under the No Program Alternative (Table 12-11).

No Program Alternative

Both commercial and residential utilization of No Program chemicals was identified as a potential outcome for LBAM control, should none of the Program alternatives be implemented. The use of these chemicals individually and collectively was considered to represent potentially significant impacts because HQs exceeded 1.0 for one or more species modeled within a guild, by exposure pathway (Table 12-12). Further, under the No Program scenario, eradication would be extremely unlikely, and repeated (long-term) use was considered likely. No Program pesticide use has the potential to increase with crop damage caused by LBAM over time, in the absence of other use restrictions that might be placed on currently approved chemicals. Only three of the several conventional pesticides approved for use in nurseries and host crops were evaluated in this PEIR to be representative of other approved pesticides. The use of other pesticides that would also be effective for LBAM control (e.g., carbaryl, dimethoate, methoxyfenozide, phosmet etc.) could increase as well. Under this scenario, the two organically approved pesticides (Btk and spinosad), which are also considered under the Organically Approved Insecticides Alternative, would likely increase.

The selection of which approved pesticide might be used is up to the consumer, and identifying use predictions at a statewide scale is not possible. Furthermore, a cumulative effects analysis of the No Program Alternative is not required under law because the lead agency (CDFA) would not have control over nonagency-administered control programs. However, some prediction of effects is provided for consideration.

Using permethrin as a surrogate for all insecticides that could be used, Dowell (2008b) estimated that homeowner use in 9 of the currently infested Northern California counties could increase between 281 and 2,353 pounds. When considering the full 16-county area where trapping or eradication efforts were initiated, an increase between 20,364 and 74,305 pounds of permethrin was considered possible. These estimates were based on (1) an estimate of single-family dwellings in the overall treatment area from Census Bureau statistics, (2) an estimate of the number of these houses that might apply insecticide (3 to 7 percent), and (3) an assumption that those houses that treat would only do so once a year. These input variables were applied to yield the estimates of increased use (i.e., increase use [pounds] = # residences x 1 gallon spray/residence/year x 0.0106 or 0.024 pound permethrin per spray event). Similarly, Dowell (2008a) estimates an annual increase in use from 600 to 4,800 pounds of Bt (1.4 to 10.5 percent), and 1,900 to 3,800 pounds of spinosad, in the *absence* of the implementation of Program alternatives.

In addition to the projected increase in use, as discussed above, all of the nonorganic, conventional No Program pesticides evaluated in the PEIR have been identified in environmental monitoring programs in the state of California. Organophosphate use, such as chlorpyrifos, has been decreasing. However, seven waters of California have been placed on the Section 303d list by the USEPA due to chlorpyrifos as part of the final 1998 Section 303(d) (Clean Water Act) list of impaired water bodies in California. As a result of the Section

303(d) listings and other legal actions, four Total Maximum Daily Loads for chlorpyrifos have been initiated in California.

Overall, the trend is towards reduced pesticide use in California. One way to observe pesticide utilization trends in California is through DPR annual sales reports. DPR tracks the pesticides sold throughout the state on an annual basis. In 2006, 190 million pounds of pesticide and herbicide were used, including organically approved pesticides. This usage represented a reduction of nearly 6 million pounds over what was used in 2005. Most of this reduction was attributed to a 24 percent decrease in the use of sulphur, an organically approved fungicide. In 2006, statewide insecticide use decreased by 10 percent in pounds of active ingredient and by 3 percent in acres treated, compared to 2005. This decrease was accompanied by the 5 percent increase of acres harvested. The decrease in acres treated with insecticides was mainly associated with the decreased uses of chlorpyrifos (-19 percent), methomyl (-42 percent), and carbofuran (-35 percent) (DPR 2005, 2006c, 2007b). In 2007, 1,806,444 pounds of chlorpyrifos, 85,771.34 pounds of lambda-cyhalothrin, and 354,808.08 pounds of permethrin were sold (DPR 2007b). By comparison, in 2006, 2,516,047.67 pounds of chlorpyrifos, 54,754.22 pounds of lambda-cyhalothrin, and 605,304.35 pounds of permethrin were sold (DPR 2006c). While amounts sold do not translate directly to the amounts used, these data suggest reductions in use of chlorpyrifos may be occurring statewide. While organophosphate sales appear to be declining most recently (Table 12-12), the use of pyrethroid-based insecticides appears to be holding relatively steady when considering a longer period of record. For some members of this class of compounds (lambda-cyhalothrin), use is increasing.

Environmental monitoring provides additional information about the potential for cumulative impacts from pesticide use. Where detections of specific pesticides are common, the potential for cumulatively considerable impacts from incremental uses may be considered more likely if the analyte detected has associated toxicity. In a relatively recent study, Bacey et al. (2004) sampled for permethrin and related pyrethroids (e.g., lambda-cyhalothrin) and organophosphates in water and sediment samples from the Sacramento and San Joaquin watersheds collected after storm events. Permethrin and/or esfenvalerate were detected in 7 of 40 whole water samples, with concentrations measured up to 0.094 ppb. Review of these data showed that permethrin was only detected in one sample, and the majority of pyrethroid detections were for esfenvalerate. Lambda-cyhalothrin was apparently not analyzed in water samples, but was analyzed in sediment and was not detected. In contrast, trace amounts of chlorpyrifos were identified most consistently among the three No Program pesticides evaluated. Significant toxicity was also identified in the water flea (*Ceriodaphnia dubia*) when exposed to the water samples collected that contained detectable pyrethroids. The authors noted, however, that the same samples also contained other pesticides from the storm runoff, and the concentrations of some of these constituents (e.g., diazinon) by themselves were sufficient enough to account for the observed toxicity in five of the seven samples. The effects of additive or synergistic toxicity could not be resolved. Only one sediment sample contained detectable pyrethroid (bifenthrin).

As the continued use of these pesticides is foreseeable throughout the state and could increase in the absence of the implementation of Program alternatives, and monitoring data suggest their persistence and/or mobility in the environment. As conclusions on cumulative impacts typically are not evaluated under CEQA for a No Program Alternative, none is offered here. Consequently, no conclusion regarding the cumulative impacts of the No Project Alternative has been reached, but the qualitative information given above is nonetheless provided for consideration.

14.11 GREENHOUSE GASES AND CLIMATE CHANGE

Scientific consensus concurs that global climate change will increase the frequency of heat extremes, heat waves, and heavy precipitation events. Currently accepted models predict that continued GHG emissions at or above current rates will induce more extreme climate changes during the 21st century than were observed during the 20th century. A warming of about 0.2°C per decade is projected. Even if the concentrations of all GHGs and aerosols are kept constant at year 2000 levels, a further warming of about 0.1°C per decade would

be expected. A faster temperature increase will lead to more dramatic, and more unpredictable, localized climate extremes. Other likely direct effects of global warming include an increase in the areas affected by drought, an increase in tropical cyclone activity and higher sea level, and the continued recession of polar ice caps. Already some identifiable signs exist that global warming is taking place. In addition to substantial ice loss in the Arctic, the top 7 warmest years since the 1890s have been after 1997 (IPCC 2007a, 2007c).

The overall global climate change will be of social and economic losses. These negative effects will likely be disproportionately shouldered by the poor who do not have the resources to adapt to a change in climate. Some of the main ecosystem changes anticipated are that biodiversity of terrestrial and freshwater ecosystems could be reduced and that the ranges of infectious diseases would likely increase.

Cumulative impacts were assessed in a qualitative manner by determining if the Program alternatives, in conjunction with other projects and planned growth throughout the Program Area, would have the potential to contribute to a long-term cumulative impact on climate change. Given that GHG emissions and climate change are global issues, a statewide framework or cumulative approach for consideration of environmental impacts may be most appropriate. Virtually every project in the state of California, as well as those outside the state, would have GHG emissions.

All Program alternatives would generate some GHG emissions individually but would not conflict with present regulations, even if ground and aerial methods are used on the same day, subject to plane (4) and ground crew (12) limitations. No potentially significant impact would occur as a result of any of the Program alternatives, and mitigation is not required for GHGs and climate change. However, optional mitigation measures for Alternatives MD-1, MD-2, MMA, Btk and S, and Bio-P are listed in Section 13.2.12. Even with mitigation, these alternatives would generate GHG emissions and incrementally contribute to climate change but only in the short term.

When all Program emissions are viewed in combination with global emissions levels that are contributing to the existing cumulative impact on global climate change, the incremental contribution of these Program emissions would not be cumulatively considerable because they occur in the short term and would conclude by 2015. Therefore, all Program alternatives (either individually or in combination) would not have a cumulatively considerable impact on global climate change. If optional mitigation measures are implemented, the Program alternatives' incremental contribution would be reduced further.

Mitigation measures for MD-3 and SIT, which involve aerial applications, have not been established or identified. However, the CDFA will continue to research the alternatives and will consider implementing mitigation measures for aerial application if appropriate mitigation measures are identified. In the meantime, the CDFA will consider obtaining carbon offsets for a portion of the GHG emissions associated with the aerial application.

14.12 SUMMARY OF CUMULATIVE IMPACTS

The summary of findings from the discussion above addresses Program alternatives with less-than-significant impacts or potentially significant impacts (that can be mitigated to less than significant).

- **Agricultural/Horticultural Resources and Economics:** The Program alternatives have the potential to result in impacts on organic farming and beneficial insects from increased pesticide use. The LBAM Program's less-than-significant, incremental impacts would not contribute considerably to cumulative impacts to (1) organic farming and (2) beneficial insects important to agricultural and horticultural resources.

- **Urban and Rural Land Uses:** No potentially significant or even less-than-significant incremental impacts to urban and rural land uses would occur as a result of any of the Program alternatives. Therefore, no cumulative impacts would occur.
- **Noise:** The Program's incremental contribution to the cumulative noise impact in a community (where noise comes from many sources) on sensitive receptors is potentially cumulatively considerable. Such cumulative impacts are considered significant but can be mitigated to less than significant through avoidance of applications near sensitive receptors and with the implementation of noise-reducing measures.
- **Air Quality:** The incremental impacts on air quality from the LBAM Program are not individually significant nor are they cumulatively considerable.
- **Public Services and Hazard Response:** The LBAM Program does not have incremental impacts on public services, and implementation of any of the Program alternatives (individually or in combination) would not result in a significant contribution to any cumulative public services and hazard response impacts that could result from other projects in the vicinity of the treatment areas.
- **Human Health:** Because no human health impacts were identified in association with the chemical and biological pesticides evaluated under Alternatives MD, Btk, and S, the Program makes no incremental contribution to any pre-existing cumulative impacts. For Alternative MMA, the CDFA estimates the incremental annual usage of permethrin to be 2,970 pounds. This increase in use is well within the variation of sales under the environmental baseline (as a projection of use) identified in Table 8-51. No increase in the use of permethrin by other programs is reasonably foreseeable, and the impacts are concluded to be not cumulatively significant.
- **Aquatic Resources:** The less-than-significant impacts to food supply for fish under some Program alternatives would not contribute incrementally to any decline in fisheries throughout the Program Area. The most significant cumulative impacts to fishery resources in the state from various activities statewide are those associated with POD and the recent collapse of Central Valley salmonid populations. The LBAM Program would not contribute substantially to these fisheries issues.
- **Terrestrial Resources:** Small incremental impacts to nontarget wildlife from Alternatives MD, Btk, S, and Bio-P are not cumulatively considerable, as they do not contribute to a combined significant cumulative impact from other general pest control activities by residential, commercial, and agricultural activities occurring within the treatment areas. For Alternative MMA, cumulative impacts to nontarget species would not be significant, and the Program is not expected to result in cumulatively considerable impacts to pollinators and honeybees. Potential impacts from aerial applications of the LBAM-specific pheromone or sterile moths would be mitigated by implementation of Mitigation Measures TR-17a through c, and cumulative impacts would not occur.
- **Water Resources:** The residual impacts of Alternative MMA would not be cumulatively considerable in the regions where this treatment could occur.
- **Ecological Health:** Lepidopterans (moths and butterflies) could be impacted as a result of Program pheromone applications under Alternative MD. However, the incremental environmental effects associated with the use of the LBAM pheromone under Alternative MD do not result in cumulatively considerable impacts. Alternative MMA offers limited potential for incremental increase in permethrin use that could be cumulatively considerable. Because the increase in permethrin use under Alternative MMA is well within the summary of projections of use by other programs and private users, the Program's incremental contribution to the cumulative condition is not significant. The use of Btk and/or spinosad is not anticipated to result in impacts that would be considered cumulatively considerable for nontarget insects and pollinators. A reasonably foreseeable incremental increase in the Program's use of Btk or spinosad that could affect special-status insect species is not anticipated to result in cumulatively significant impacts.

- **Greenhouse Gases and Climate Change:** When all Program emissions are viewed in combination with global emissions levels that are contributing to the existing cumulative impact on global climate change, the incremental contribution of these Program emissions would not be cumulatively considerable because they occur in the short term and would conclude by 2015. Therefore, all Program alternatives (either individually or in combination) would not have a cumulatively considerable impact on global climate change. If optional mitigation measures are implemented, the Program alternatives' incremental contribution would be reduced further.

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