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**Analysis of the Regulatory Effects on California Specialty Crops: An Examination of Various Issues Impacting Selected Forest Products, Tree Fruit, Nut, and Vegetable Crop Industries**

**Report prepared for the California Institute for the Study of Specialty Crops**

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## EXECUTIVE SUMMARY

This research report is the culmination of three separate but related studies. The first study examined what effects the regulatory environment is having on producers in California. This issue was investigated with the use of a producer's survey. This survey examined producer's perceptions and attitudes regarding the regulatory environment. A cost of the regulatory environment as it pertains to operating cost was estimated from this survey. An in-depth look at how ten regulatory areas are affecting producers in the forest product, tree fruit, nut, and vegetable crop industries from both a cash and non-cash standpoint were investigated. A ranking of these regulatory areas was developed for 14 different specialty crop industries.

The second study looked at how delays in pesticide registration is affecting agricultural producers. Results from the producers' survey show that pesticide registration is one regulatory area that is having an impact on many of the industries in this study.

The third study focused on the forest products industry. It examined how the California regulatory environment differs from Oregon in terms of the forest product industry. This study also examined the difference in cost for 2 forest product producers who have operations in both California and Oregon.

### **Major Findings from the Producers' Survey**

Twenty-six percent of the participants in the survey identified the regulatory environment in California as Not Complex. Over 21% indicated that the regulatory environment is Very Complex. Nearly 30% of the respondents found the regulatory environment Somewhat Complex, while approximately 23% found the regulatory environment Complex.

The producers in any given year have contact with an average of 2.18 local agencies, 2.00 state agencies, and 1.44 local agencies. Less than a third of the producers found no duplication of effort between these agencies. Nearly 50% believe that there is some duplication of effort, while approximately twenty percent believe there is a lot of duplication of effort between the agencies. Seventy percent of producers found duplication at the local level, 65% at the state level, and 51% at the federal level.

Worker's Compensation, air quality, and land use regulations were the three highest ranking regulatory areas having a negative impact on their financial, operational, and managerial aspects of production. Pesticide application had the largest perceived positive impact at 37%. Pesticide registration and food safety regulations round out the top three regulatory areas positively impacting producers at 33% and 31% respectively.

Non-cash compliance costs are ranked higher than cash compliance cost which would imply that the highest impacting costs are non-cash related. Hence any estimation based on cash costs would really be an underestimate of what the true cost of regulations are.

In the last five years producers invested one in every nine dollars to capital investment for regulatory compliance. Of that dollar that is allocated towards regulatory cost, 16% is allocated

to workers safety, 13% goes to abatement of water discharge, 9% to abatement of air emissions, and 6% towards providing wildlife habitat.

Eighty-seven percent of the producers believe they have gained no efficiency from capital investments that were required to satisfy a regulatory requirement. Of the remainder who believed they gained efficiency from making the capital improvement, over 70% believe that the gain in efficiency did not compensate the increase in cost. Only 7.68% of the producers in the study received cost share assistance for improving capital equipment to meet regulatory standards. These results would suggest that most producers are not directly benefiting from regulatory induced capital investment.

The producers in the survey indicated that the percentage of operating cost devoted to regulatory compliance in 1999 was 6.30%. In 2004, this percentage has increased to 10.67% representing a sixty-nine percent increase in the last five years.

Workers compensation is identified as the top regulatory area increasing producers operating costs. Pesticide application ranks second in terms of operational costs, while air quality regulations ranked third.

Many fees over the last five years have increased substantially for the producer. Burning permits averaged \$38 in 1999 and have increased to \$129 in 2004 representing a 240 percent increase in costs. Air quality fees have increased 940% from 1999 to 2004. Chemical use fees have increased by 125%. In this same time period, workers' compensation has increased on average by \$11,625 representing a 180% increase.

Around 61% of the producers believe that the regulatory environment has affected their ability to effectively manage their farms. Producers have seen a 40% increase in their management time allocated toward regulatory issues. In 1999, producers estimate that they spent 7.31% of their time on regulatory issues, while in 2004 it increased to 10.27%.

Nearly five percent of the respondents in the survey produce outside of California. Approximately 74% of this group found the California regulatory environment more restrictive than the other state they are producing in.

It appears that the option considered most by producers due to the regulatory environment was leaving agricultural production. Over 45% of producers have considered leaving agriculture because of the regulatory environment. Results imply that producers are more likely to exit the industry or prepare to exit the industry rather than increase their operational size to potentially gain economies of scale. This suggests that producers would prefer to leave agricultural altogether rather than leave California.

### **Cost of Regulatory Compliance for California Agricultural Producers**

The estimated regulatory cost in relationship to operating costs for producers is between \$2.19 billion to \$2.21. It must be emphasized that this estimated range is a lower bound on the cost of regulatory compliance that producers must pay. Due to limitations in the survey, no estimate was made for the capital costs that are incurred by producers due to the regulatory environment.

At approximately 87%, the largest producers (income above \$500,000) are paying the lion's share of the regulatory costs. Examining the percentage of income devoted towards regulatory compliance shows that many of the middle income brackets have higher percentages of their farm income devoted to regulatory compliance. The range on percentage of income allocated to regulatory cost is between 5.24% to 9.19%.

### **An Industry-by-Industry View of the Complexity of the Regulatory Environment and a Ranking of the Regulatory Areas Affecting Each Industry**

Eight industries had over fifty percent of their producers identify the regulatory environment as either Complex or Very Complex. These industries were: the melon industry, the berry industry, the stone fruit industry, the leafy vegetable industry, the timber industry, the tree nut industry, the grape industry, and the root vegetable industry. Nine out of the fourteen industries had less than twenty-five percent of their producers indicating that the regulatory environment is Not Complex. It is clear from the producer's survey that most industries find the regulatory environment in California at a minimum Somewhat Complex.

Examining how each regulatory area affects each industry of importance in this study, an identification of the top three regulatory areas was done when clearly possible. A regulatory area was identified as a top three issue if it ranked in the top three for both increasing operating costs and having a negative impact on the producer. The list given below identifies which regulatory areas were ranked in the top three for a particular industry.

#### **Workers Compensation**

- Berry Industry
- Citrus Industry
- Deciduous Fruit Industry
- Miscellaneous Fruit Industry
- Stone Fruit Industry
- Grape Industry
- Horticultural Industry
- Tree Nut Industry
- Miscellaneous Vegetable Industry
- Root Vegetable Industry
- Vegetable Vine Industry

#### **Land Use**

- Berry Industry
- Miscellaneous Vegetable Industry

#### **Pesticide Registration**

- Citrus Industry
- Deciduous Fruit Industry
- Miscellaneous Fruit Industry

#### **Pesticide Application**

- Citrus
- Miscellaneous Fruit Industry
- Stone Fruit Industry
- Root Vegetable Industry

#### **Air Quality**

- Deciduous Fruit Industry
- Stone Fruit Industry
- Grape Industry
- Tree Nut Industry

### **Policy Implications from Producers' Survey**

There are 4 major policy implications that come out of the producers' survey. 1) Given that approximately 44% percent of the producers in the survey identified the regulatory environment as either Complex or Very Complex, it is recommended that work be done to examine whether the complexity of the regulatory environment is unduly complex. Government agencies should strive to minimize the level of complexity of the regulatory environment while still meeting the goals of the regulations. 2) Part of the complexity problem may be caused by the perceived duplication of effort between regulatory agencies. If the producers' perception is valid, there

may be an opportunity for the government to gain some efficiency by tracking down where the duplication is occurring and try to minimize it. 3) Workers' compensation is on the top of the list of regulatory areas affecting producers. With a 180% increase in the last five years, the California government should put this as a top regulatory issue that needs a solution. 4) Every indication in the survey shows that the regulatory environment is increasingly absorbing more and more of the producers' resources. The most important policy implication of this work is that government agencies need to make an effort to minimize the impact of regulatory environment on producers while still maintaining their goals. This requires them to not only examine the marginal effect of a regulation on the regulatory environment, but to also the cumulative effect.

### **Pesticide Registration Delay Case Study**

The production of specialty crops often requires inputs such as pesticides to promote vigorous plant growth and to control pests such as insects, weeds, and diseases. For pesticides to be used legally, they must go through a series of scientific and administrative steps to obtain a license or registration. This authority has been established through several federal statutes such as the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Federal Food, Drug and Cosmetic Act (FFDCA). The Food Quality Protection Act (FQPA) of 1996 was designed to strengthen these statutes by establishing health based standards for use in the risk assessments associated with FIFRA and FFDCA.

While California seeks to be a leader in specialty crop production and innovative, reduced risk pest management, the established regulatory framework required by state law often limits the availability of safer products and is often assumed to be costly to growers. This study looked at the registration timelines of 3 pesticides which had received Federal registrations from the US Environmental Protection Agency (US EPA), but were subsequently delayed at the state registration level. Pesticide products for this study were selected because they represented reduced risk alternatives to existing pesticides (e.g., organophosphates) or they were of potential use in resistance management programs.

The cases presented showed that registration delays did not necessarily result in economic losses for growers because newer products are generally more costly than older products. However, these delays did reduce the availability of materials which could provide significant benefits in terms of reduced risk toxicological profiles or as pesticides useful in resistance management programs. It is recommended that commodities identify critical pest management needs as early as possible in the research and development phase to support registration requests to IR-4, US-EPA, and California Department of Pesticide Regulation (CDPR). Registrants should be diligent in providing follow-up information as requested by CDPR. The California Department of Pesticide Regulation should ensure that its administrative process allows timely registration of crop protection chemicals, especially those products deemed "reduced risk" by US EPA.

### **Timber Harvesting Case Study**

This case study was part of a long-term project designed to assess the economic and ecological impacts of California's environmental regulations that are directed at forestry practices. An earlier study identified that the costs of planning and preparing a timber harvest had increased over 1200% since the mid 1970s when environmental laws affecting forestry were incorporated in the recently passed Forest Practices Act.

The purpose of this study was to determine the effect of California's environmental regulations on timber harvesting costs. The focus of many environmental regulations governing forestry operations is the protection of water quality and wildlife habitat. Presumably, the alteration of harvesting activity to protect these values would increase costs. Our approach was to compare similar operations in California with those of Oregon, a state with far fewer rules and regulations for protecting these environmental values. Two firms out of those few firms meeting these conditions responded – one with two detailed paired timber sales.

Results indicate little effect on total harvesting costs. Most of the expected impact on harvesting costs can be mitigated in the planning phase where increasing costs were detected. However, California's high workers compensation rates and fuel costs were significantly higher than in Oregon. Any further research into the effects of forest practice regulations on timber harvesting costs needs to focus on specific regulations and changing land uses.

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## Chapter 1: Introduction

In a research report for the California Institute for the Study of Specialty Crops, Hurley provided a broad overview of the web of regulatory bodies affecting California agricultural producers. He found that California specialty crop producers must comply with multiple regulations from multiple local, state, and federal agencies. Locally, producers must comply with county land use regulations developed by the county, as well as, regulations established by the County Agricultural Commissioner. At the state level, producers must follow the regulations established by California Environmental Protection Agency (CALEPA), the Department of Pesticide Regulation (DPR), and the California Department of Food and Agriculture (CDFA). The United States Department of Agriculture (USDA), the United States Environmental Protection Agency (EPA), and the United States Department of Labor are the major federal regulators specialty crop producers must deal with at the national level.

Regulations from local, state, and federal agencies encompass a wide variety of issues including: labor, worker safety, environmental quality, marketing, food safety, pesticide use, biosecurity and others. In some instances, the agency that has regulatory authority is clear-cut, while in other instances the authority is not so clear. In some cases, there may even be a conflict in authority and goals between agencies. With these multiple agencies overseeing the producer, there is a possibility that a duplication of effort is occurring. A couple of questions that arise regarding duplication are how much is there of it and where is it occurring the most.

Regulations can have many different effects on producers—both positive and negative. On the positive side, regulations can improve marketability of the crop and increase worker's safety. While regulations can have a positive effect on producers, the largest benefits may go to society. But, regulations can also negatively affect producers. They can increase their cost of production by mandating that producers use more costly or less efficacious inputs. Regulations can reduce competitiveness by restricting producers to using certain technologies. In many cases, California specialty crop producers are not allowed to use inputs that are available to both domestic and global competitors. One question that needs to be answered is whether the positive impacts outweigh the negative impacts.

In 1995, the University of California's Agricultural Issues Center (AIC) conducted a survey of 263 California farmers to analyze the impacts of government regulations on California farms (Coppock). This survey focused on farmer's perception and attitudes towards regulations. This research found that more than 70% of the farmers surveyed were affected by regulations in the past three years. These effects ranged from increased paperwork required to be in compliance with regulation to changes in the availability and/or use of chemicals and antibiotics for crops and livestock.

Esseks et al. also did a study that examined farmers' attitudes and perceptions relative to the cost of regulations. In their study, they examined how farmers perceived land use regulations and how these impacted the value of their farmland and ranches. This research was a national study of 1,729 respondents from six regions in the US—the West, Southern Plains, Northern Plains, Midwest, Southeast, and Northeast. A major finding in this study was that 46.8% of the respondents believed that their land was devalued due to one or more government regulations.

Both the AIC and the Essek et al. studies suggest that government regulations are perceived as a continuing concern for California producers. While both studies show that producers perceive that regulations are causing a burden, there is very little research that delineates what aspects of regulations are causing producers the most difficulty. Is it one particular regulation? Is it the rate of regulations being imposed on the producers? Is the regulatory environment causing an environment of production uncertainty? Is it the aggregate effect of all regulations that are causing producers burden? The problem producers are facing has not been clearly defined.

Much work has been done on estimating the effect of regulatory costs on manufacturing businesses. Gray found evidence that the cost of regulation imposed by Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) reduced productivity growth in the manufacturing industry. Crain and Hopkins found that small businesses “bear a disproportionately large share of the regulatory burden (pg. 2).”

In relationship to the magnitude of the problem, little work has been done on examining the impact of regulations on California agriculture. A few studies exist that examine the marginal/specific effect of a change in a regulation on a particular industry. For example, Carter et al. conducted an economic analysis on how the January 2001 DPR regulations would affect the strawberry producers, as well as the whole strawberry industry. Carter et al. found that the January 2001 fumigation regulations “imposed a relatively higher cost on growers with smaller fields (pg. 3).”

There have been a few studies done that have examined how a particular regulation would affect California producers on the aggregate. One such example is a study by Cash and Swoboda. They attempted to analyze the aggregate cost to agricultural producers from banning organophosphates. But regulation studies on the impact of regulations on California producers are scarce. This makes it difficult to develop a picture of the regulatory environment that California specialty crop producers face.

While the effects of one regulation may cause little if any harm to an industry when examined in isolation, the cumulative effects can erode the competitiveness of a crop, especially in a global economy. One regulation’s effect may be seemingly small, but it could be the impact that pushes the costs to the point that it is better not to produce, i.e., the shutdown point. Few studies, if any, have taken into consideration the effect a new regulation has on the cumulative effect of all the regulations. Currently, there is no base line that exists regarding the cost of regulations to even do a cumulative effect analysis.

What makes California agriculture relatively unique is that it has a very diverse agricultural economy. Hence, when a regulation is adopted, it can affect each crop differently—some in a minor way and others in a major fashion. This is not very well understood and has not been examined well. To the researchers’ knowledge, no one has developed a cost of the regulatory system on agricultural producers as a whole.

One way of examining the burden of regulations is to examine cost benefit studies that have evaluated the effects regulations have had on commodities. President Ronald Reagan in 1981

signed Executive Order 12291. This order directed Federal regulatory bodies to analyze the impact of a regulation using cost benefit analysis before the regulation is implemented except where the law expressly forbids it (Hazilla and Kopp). In 1993, President William Clinton with Executive Order 12866 reaffirmed the executive order set forth by Reagan. It states, “In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating (National Archives and Records Administration).”

## **Objectives**

There is much anecdotal evidence that the regulatory environment is having an effect on producer’s ability to manage their enterprises. This anecdotal evidence is being used to make policy decisions that affect producers all around the state of California. There appears to be very few facts about the California regulatory environment and how it is affecting producers. The overall goal of this research report is to shed light on the regulatory environment in California and develop some facts about it. When this research was initially proposed it laid out the following five objectives:

- ❑ Objective 1: Identify the top five regulations affecting production that impact specialty crop producers in the tree fruit, nut, and vegetable crop industries.
- ❑ Objective 2: Develop a synthesis of the federal and state cost studies that have examined what effect the top five regulations have on the tree fruit, nut, and vegetable crop industries.
- ❑ Objective 3: Examine whether a deficiency exists in cost/benefit studies of major regulations important to the forest products, tree fruit, nut, and vegetable crop industries.
- ❑ Objective 4: Assess the impact associated with delayed registration of new pesticides which result from the requirement that pesticides must be registered in California after they have been approved by the US EPA.
- ❑ Objective 5: To demonstrate the trend and status of increased environmental regulations affecting the California forest product industry’s stump-to-mill costs over the last thirty years.

As this eighteen month project comes to a close, the five objectives have been changed. Through the course of this project, it was discovered that identifying issues with particular regulations would be an insurmountable task. With so many regulations affecting so many different agricultural industries, it was discovered that it is more reasonable to examine regulatory areas rather than particular regulations. This finding is discussed in more depth in chapter two. Also discovered was that there seems to be no studies beyond the ones mentioned above that specifically look at regulatory effects to the forest products, tree fruit, nut, and vegetable crop industries in this study. Hence, objectives two and three have been taken out of the report and the conclusion is drawn that there is a delinquency in studies that examine how regulations affect producers of interest in this study. While two of the original objectives were deleted, two were added. Due to the success of the producers' survey that was sent out, two objective have been added to the project. The first objective examines how the California producers view the regulatory environment. This extends objective one because the focus of the report is no longer the tree fruit, nut, and vegetable crop industries. This report now provides a view of all specialty crop industries in the state. The second objective added is related to estimating a cost of the regulatory environment to California producers.

With these modifications discussed above, the five objectives that will be the focus of this report are the following:

- ❑ Objective 1: Provide a view of how the California regulatory environment is affecting California producers.
- ❑ Objective 2: Develop a baseline cost of the regulatory environment on California producers.
- ❑ Objective 3: Identify the top three regulatory areas affecting production that impact specialty crop producers in the tree fruit, nut, and vegetable crop industries.
- ❑ Objective 4: Assess the impact associated with delayed registration of new pesticides which result from the requirement that pesticides must be registered in California after they have been approved by the US EPA.



- Objective 5: To demonstrate the trend and status of increased environmental regulations affecting the California forest product industry's stump-to-mill costs over the last thirty years.

The rest of this report is broken-up into chapters two through six. In chapter two a discussion of the methodology is given for the producers' survey that was used to collect data. This survey was used to develop a picture of the regulatory environment through the eyes of the producers. The methodologies that were used in the case studies are explicitly written in the case study chapters. Chapter three of this report presents the results of the producers' survey. This chapter starts with an explanation of the results of the survey in aggregate form. It then presents a lower end estimation of the cost of the regulatory environment on California agricultural producers. The chapter culminates in an analysis of how the regulatory environment is affecting the main industries of concern in this report—forest products, tree fruit, tree nut, and vegetable industries. Chapters three covers objectives one through three of the proposal. The fourth chapter of this report presents a look at how the delay in pesticide registration is affecting producers. This chapter accomplishes objective four. Chapter five of the report presents a study that meets the fifth objective. This study compares the regulatory environment in California versus Oregon for the forest products industry. The final chapter of the report highlights the major findings and presents some policy implications from the producers' survey.

## **Chapter 2: Methodology for the Producer's Survey**

This project is the culmination of three different studies regarding different aspects of the regulatory environment. The first study revolves around a survey of specialty crop producers regarding their attitudes towards the regulatory environment in California. The second study is examines the effects of delays in pesticide registrations. The third study is a case study of the forest products industry in California and how it differs in comparison to Oregon. This section of the report is meant to discuss the methodology of the first study mentioned. The methodologies of the second and third study will be discussed in the respective chapters in which they are each presented.

In order to get at producers attitudes towards the regulatory environment, a three step process was undertaken. In the first step, a group of industry professionals were brought together in a focus group to lay the initial foundations of building a survey for producers. The purpose of the focus group was twofold. The first purpose was to develop an understanding of how producers look at and understand regulations. The second purpose of this group was to identify the regulations that were having the greatest effect on producers. After this focus group was conducted, information was taken from the focus group to build a producers survey. The producers' survey was sent out to the participants of the focus group as well as a select group of industry representatives to examine it for clarity. The final step was to send the survey out to a random sample of producers using the California Agricultural Statistical Service.

The producer focus group was held in October of 2004 at the Heritage Complex in Tulare, California. Sixteen industry representatives were invited to participate in this meeting. Each member was chosen because of his/her knowledge of their respective industries and usually was part of a board or commission. A letter of invitation, which can be found in Appendix A, was sent in September. Out of the sixteen representatives invited, seven showed up to participate in the focus group. The specific commodities that this report focuses on were well represented by these seven people.

A five step process for the focus group participants was developed to gather information regarding how the regulatory environment is impacting agricultural producers. Step one of the

process had the producers identify the most burdensome regulatory issues for the commodity they represented. The second step of the process asked the producers to develop a set of burdens that are caused by the California regulatory environment. An example of a burden used was the time required for handling the regulation. The next step in the process asked the participants to develop a set of components identified from step two. The fourth step asked the producers to give weights to the burdens and their corresponding components. These weights ranged from zero to one hundred. The sum of the weights that were given to the burdens had to sum to one hundred, as well as, the components of each burden had to sum to one hundred. The final step of the process was for each participant to assign an importance value to each component of each burden for each identified regulatory issue. These importance values could range from zero to one hundred, but they did not need to sum to one hundred. For a full set of the instructions, see Appendix A.

Due to the complexity of the issues and the limited time available for the focus group, the full exercise was not completed at the focus group. The researchers managed to complete the first three steps, which in itself was quite enlightening. Since this focus group was meant as an information gathering tool for the survey, the specific results will not be discussed in this report and only generalization and lessons learned will be presented.

The most significant finding from the focus group is that producers would have great difficulty identifying particular regulations that caused them the greatest difficulty. It was suggested by the members of the focus group that questions in the producer's survey should focus on regulatory areas, e.g., air quality, water quality, food safety, etc., rather than specific regulations. Since specific regulations could not be realistically examined, objective one needed to be changed to regulatory areas rather than specific regulations. In retrospect, it makes sense that producers would have difficulty identifying particular regulations. With so many commodities produced in California and the multitude of regulations that must be followed, it is not a particular regulation that is causing problems as much as it is the many regulations together. What may be an important regulation to one producer may not affect another producer.

The regulatory areas that the focus group suggested examining were: 1) air quality, 2) food safety, 3) land use, 4) occupational hazards and safety, 5) pesticide applications, 6) pesticide registration, 7) solid and hazardous waste disposal, 8) water quality, 9) wildlife protection, and 10) worker's compensation. Of the ten items listed the only one that is a regulation is worker's compensation, the rest are regulatory areas that encompass a wide variety of regulations. Worker's compensation was the only regulation that the focus group could fully come to consensus on as an issue identifiable to producers.

From the information gathered at the focus group, the next step undertaken was to build the producer's survey. The survey was broken into five major areas—general demographic information, the regulatory environment, regulatory compliance cost, technological choice, and managerial issues. This survey sent to the producers is located in Appendix B.

In the general information section of the survey, general demographic questions were asked including business organization, top three revenue producing agricultural products produced, number of acres, primary location of the operation, average gross farm income, and percentage of income to fixed and operating costs. In order to get a higher response rate on gross farm income, six income ranges were used: 1) Less than \$10,000, 2) \$10,000 to \$49,999, 3) \$50,000 to \$99,999, 4) \$100,000 to \$249,999, 5) \$250,000 to \$499,999, and 6) \$500,000 and More.

The second section of the producer's survey covered the regulatory environment. Producers were asked about the complexity of the regulatory environment, duplication of effort by regulatory agencies, the impact of differing regulatory areas, and the ranking of regulatory costs. Producers were requested to indicate whether they believe the regulatory environment is Not Complex, Somewhat Complex, Complex, or Very Complex.

There were three questions regarding duplication of effort. Producers were invited to categorize the duplication of effort into three different levels—None, Some, and A Lot. They were also asked whether they found duplication at the local, state, and federal levels. The third question on duplication asked how many local, state, and federal agencies producers directly deal with concerning regulatory compliance.

Two questions in this section of the survey were meant to examine how the regulatory environment is affecting producers. The first question solicited which three agencies had the greatest positive impact and greatest negative impact. The second question regarding the impact of the regulatory environment asked producers to identify the type of impact that differing regulatory areas had on their financial, operational, and managerial decisions. This question was meant to obtain how differing regulatory areas affected the producers overall operation. These impacts represented both cash and non-cash impacts. The ten regulatory areas examined in this question were the ones developed from the focus group. Producers were also asked to rank these regulatory areas in order of impact. Most producers had difficulty with this task, so the results were omitted from the report.

The final question in this section asked producers to rank five regulatory costs that potentially have an impact on their farm/ranch. These costs were allocated under the following five areas: 1) Cash Compliance Costs, 2) Non-Cash Costs, 3) Indirect Costs, 4) Risk and Uncertainty, and 5) Technological Choice. The cash compliance costs category was meant to examine out-of-pocket costs, while the other four areas investigated implicit costs that do not necessarily have an out-of-pocket expense. For example, the non-cash costs had confusion caused by the regulatory environment an example of a cost. Confusion does not necessarily represent a cash cost, but it does have an overall cost on the operation.

The third section of the survey dealt with the regulatory compliance costs of the regulatory environment. The first set of questions examined how the regulatory environment affected capital investment. These questions solicited the percentage of capital investments allocated towards regulatory compliance and what regulatory areas that capital was invested in. A follow-up question was asked to see if the investment in capital led to increased operational efficiencies and whether the increase in operational efficiency compensated the outlay. A final question related to capital investment asked whether the producers have received any cost share assistance for making the capital investment.

The next set of questions in this section enquired how the regulatory environment is affecting the producers operating costs. Producers were asked to identify what percentage of their operating costs went to regulatory compliance in 1999 and 2004. The producers were then asked to indicate the three regulatory compliance activities that had most significantly increased their operating costs over the past five years. The regulatory areas used for this question were taken from the previous question. Producers also had the option of choosing Unsure and None for this question. The last set of questions in this section enquired about the fees producers paid on a select group of regulatory items and worker's compensation costs for 1999 and 2004. The fee areas examined were Air Quality, Burning, Chemical Use, Solid Waste, and Water Quality. These fees were identified by the focus group as the major fees producers face.

Sections four of the survey examined how the regulatory environment affects technological choice. Producers were asked how restricted their technological choice is due to the California regulatory environment. They were given the option of choosing Not Restricted, Somewhat Restricted, or Severely Restricted. They were also asked how the delay in pesticide regulations impacted their operations.

The last section of the survey investigated how the regulatory environment is affecting the producers' ability to manage their operations. The first question in this section asked the producers to identify what percentage of their management time was spent handling regulatory issues for 1999 and 2004. Producers were then asked to identify whether the complexity of the regulatory environment affected their ability to manage their operations.

The next two questions asked about the legal risks of the regulatory environment. The first question on legal risk asked producers to identify the level of risk they believed was caused by the regulatory option. Producers were able to choose between No Risk, Low Risk, and High Risk. The producers were next asked to identify whether they have found it more necessary to consult an attorney about the regulatory environment over the past five years.

The producers were next asked to identify whether the regulatory environment reduced their management options regarding: 1) choice of production inputs, 2) flexibility in operational

decision-making, 3) number of crops that can be grown, and 4) land use choices. The final set of questions asked whether the producer had produced outside of California, and if so, was the other state/country regulatory environment less restrictive, comparable, or more restrictive. The last set of questions asked producers if they considered the following options due to the regulatory environment: 1) move their operations outside of California, 2) increase the size of their operation, 3) decrease the size of their operation, and 4) leave agricultural production altogether.

Once the survey was designed and examined by differing industry representatives, it was sent to the California Agricultural Statistical Service (CASS) to administer. There were four major reasons why CASS was used. First, they are extremely knowledgeable in survey design. CASS is responsible for gathering the agricultural statistics for the state and federal governments. Second, since CASS gathers other statistical data from producers, the producers are more familiar with receiving surveys from CASS which should increase the response rate on the survey. Third, CASS has one of the best and most accurate databases of the producers in the state. Finally, the use of CASS allowed the researchers to guarantee anonymity of the producers' responses.

Once the survey was given to CASS, they reworked the survey to put it into a more user friendly format. After this was done, CASS ran a random sample of 10,000 specialty crop producers in the state. This gave each producer in the state approximately a one in eight shot to be a part of this study. The reason a simple random sample was chosen is because some inferences can be made from who returned the survey that could not necessarily be accomplished if a stratified sample was conducted. Since 10,000 producers were part of the sample, it was expected that a stratified sample would not be needed to ensure that every commodity, region, income bracket, etc., were represented by the survey. If an industry was truly affected by the regulatory environment in the state, it is expected that it would have a higher return rate. CASS sent out the survey in early March to the producers. Two follow-up post cards were sent out to remind producers of the survey. CASS handled all data input from the survey and returned to the researchers a data file of producers' responses where the producers were represented by numbers.

### **Data Analysis of the Producers' Survey**

The analysis of the producers' survey is broken-up into three areas in the next chapter. The first part of the analysis presents the general results from the survey. The second part of the analysis revolves around developing a cost of the regulatory environment on California producers. The last part of the analysis presents a look at how the regulatory environment is affecting producers in the forest product, tree fruit, tree nut, and vegetable industry.

There are two ways that the data will be analyzed for the first section of the next chapter. First, simple statistics will be developed for each question asked on the survey. Results will be presented in graphical or tabular form of the average response given by producers. To develop a picture on whether any bias may exist due to the topic, general demographic results from the survey are compared to the demographic results from the 2002 USDA census. This comparison was used to examine for any large biases that may have occurred due to response bias based on the topic of regulations. Since the Census was done back in 2002, it is not expected that the survey demographics will exactly match-up, but they should be close.

### **Estimation of the Cost of the Regulatory Environment to California Producers**

The survey was developed with the capability of providing a lower bound estimate to the regulatory cost that producers face. The reason that the result is a lower bound on the regulatory cost is because only the regulatory costs associated with operating expenses are estimated. There was no attempt made to estimate the cost of the capital investments made by producers due to the regulatory environment because of the difficulties that arise with estimating the depreciation of the capital good over time. To examine the regulatory cost based on capital investment would be a study in itself.

The survey did not explicitly ask the producer for the cost of the regulatory environment, but rather had questions that could allow for an estimate. There were three specific questions that allow for estimating the cost of the regulatory environment. Two questions are located in the demographic portion of the survey, while the third question was in the regulatory compliance cost section. In the demographic portion of the survey, one question asked the producers what



their gross income was. Another question in this section asked what percentage of the producer's gross income is allocated to operating costs. The third question, which came from the third section of the survey, asked the producers what percentage of their operating cost was devoted to regulatory compliance.

There were four primary steps needed to find the cost of the regulatory environment on producers. The first step required gathering information from the USDA that would allow the survey results to be expanded to all of the California producers. The next step was to establish an estimate of the cost of the regulatory environment for each producer in the survey. The third step was to develop an average cost of the regulatory environment for producers in six different income brackets. Step four required taking the information from the producers' survey and coupling it with the USDA information to develop a cost for the whole agricultural industry in California.

The first step was to gather information from the USDA that would allow for the estimation of the regulatory cost. There were three items needed for the estimation—number of farms in California, farm income, and percentage of producers broken-up by different income brackets. All of this information was found in a report on California agricultural statistics developed by Parker with USDA-ERS. As a proxy of farm income, 2004 data on agricultural sector output is used. This number was around 34.3 billion dollars. The number of farms from this report that are used for estimation purposes is 77,000. This report along with the 2002 USDA Census report was used to develop the distribution of farms across different income ranges that were used in the producers' survey.

The second step in estimating the regulatory cost was to develop a cost of the regulatory environment for each producer. This cost was estimated by multiplying the producer's income by the percentage of income devoted to operating cost. This result was multiplied by the percentage of operating cost allocated towards regulatory compliance. The outcome of multiplying these three items together was an estimate of the cost of the regulatory environment on each producer.

Since producers were asked to indicate what range of income they fell in rather than the actual dollar amount, some special considerations needed to be taken into account to make an estimate. Five of the six income brackets used in the survey had a defined range, i.e., an upper and lower end. The last income bracket had only a bottom end with no limit on the top. The only thing known about the producers' income in this bracket is that it must be at least 500,000 dollars. This requires that for this income bracket an estimation of an average income is needed for producers in this range. To obtain this estimate, three scenarios were examined. The first scenario looked at allocating all the producers below 500,000 dollars to the median of their income bracket. Hence, if a person selected an income bracket of less than 10,000 dollars, they were allocated 5,000 dollars of income. From this assumption, an estimate of farm income for producers under 500,000 was estimated. This estimated income was subtracted from the total farm income of California. The remainder of the income was divided across all the producers in the upper income bracket to establish an income estimate for this group. In terms of this scenario, this estimate was four million dollars. Scenario two followed all the steps in scenario one, except the income used for the five lowest brackets was the lower end of the income bracket. This implies that a producer who was in the lowest income bracket was allocated an income of zero. The producer in the upper income bracket had an estimated income of 4.2 million dollars. In the third scenario, all of the producers in the lowest five income brackets were allocated an income at the upper end of the range for their bracket. This implied that the producers in the highest income bracket were allocated an average income of approximately 3.8 million.

After the income was estimated for each bracket, the total cost of the regulatory environment was calculated for each producer that answered the income question, the operating cost question, and the percentage of operating cost allocated to regulatory compliance. Next, the regulatory costs were summed for each income bracket. An average cost was developed for each income bracket by dividing the total regulatory costs for each income bracket by the corresponding number of producers in that income bracket.

Once an average cost was developed for each income bracket, the 77,000 farms from the 2004 California Farm Fact sheet were allocated across the different income brackets. Next the number

of farms allocated to each income bracket was multiplied by the average regulatory cost that was estimated for that income bracket. This gave a cost of the regulatory environment for each income bracket. Finally, the regulatory cost associated with these income brackets were summed to obtain a total cost of the regulatory environment. This was done for each of the three scenarios explained above. From this information, a percentage of regulatory burden was estimated for each income bracket using scenario one.

### **Industry Analysis of the Impacts of the Regulatory Environment**

The third part of the analysis is to examine how producers view the regulatory environment and to obtain a ranking of the regulatory areas in terms of having the largest impact. To develop this view, three questions were examined for each industry. These three questions related to: 1) the complexity of the regulatory environment, 2) the impact of the differing regulatory areas on the operational, financial and managerial aspects of the farm, and 3) the top three regulatory areas increasing producers operating cost. There are fourteen industries examined in this section. They are: the grape industry, the nut industry, the citrus industry, miscellaneous fruit industry, the stone fruit industry, the deciduous fruit industry, the vegetable on the vine industry, the horticultural industry, the leafy vegetable industry, the berry industry, the timber industry, the root vegetable industry, the miscellaneous vegetable industry, and the melon industry.

The primary means of examining the data by industry from the producers' survey was developed from cross tabulation tables. These tables were developed using Greene's LIMDEP econometric software package. The cross tabulation tables were built to highlight the percentage of respondents in each industry who answered in a particular way and are graphically depicted in this section. These results could be interpreted as conditional probabilities that a producer in an industry would end up in a particular category. For the complexity question, a percentage of producers were developed for the responses Not Complex, Somewhat Complex, Complex, and Very Complex. The second question examined, which pertains to the regulatory areas increasing operating costs, presents the percentage of producers that indicated the regulatory area was one of the top three regulatory areas increasing their operating costs. The last question categorized industry producers into being positively impacted, negatively impacted, and not impacted by the

regulatory areas. For the complexity question and the impact question, the percentage of producers allocated to each category should add to one hundred percent.

In order to get an overall ranking of the top three regulatory areas impacting the California producer, two different ranking are examined. The first ranking examined comes from the question regarding the top three regulatory areas increasing the producers operating cost. Rankings for this area were developed by examining which of the regulatory areas garnered the top three percentages from the cross tabulation table. The second ranking was developed by examining the question regarding the impact of each regulatory area. The producer was given the opportunity to choose between positive impact, negative impact, and no impact. A regulatory area was ranked at the top of this list if it had the highest percentage of producers indicating a negative impact. Once these two rankings were developed, they were examined for consistency in the rankings. If a regulatory area showed up in both rankings as a top three area, then it was given a position in the top three of the overall ranking. If there was inconsistency between the two questions, this fact is noted.

A distinction needs to be made between the two questions examined for the ranking purposes and an interpretation needs to be given for each. The question that asks producers to indicate the impact of each of the regulatory areas in terms of financial, operational, and managerial aspects of the farm should be viewed as a measure of the cash and non-cash impact that the regulatory area has on the producer. The question that pertains to the top three regulatory costs that increase the producers' operating expenses gives only a cash view of the impact of the regulatory area. Hence the question asking for the impact of each of the regulatory areas encompasses the question regarding the regulatory areas increasing the operating costs. If the two match-up in the rankings, this implies that the operating costs due to the regulatory area are dominating the overall impact of the operation. If on the other hand they do not correspond closely with each other, this would imply that there are non-cash costs due the regulatory area that are having a substantial impact on the producers that outweigh the cash cost.

## **Chapter 3: Producer's Attitudes and Perceptions of the Regulatory Environment in California<sup>1</sup>**

The previous chapter provided a discussion on the methodology for building a producers survey that would examine the producers' views of the California regulatory environment. This chapter is meant to summarize the major results from that survey and is broken-up into six sections. The first section of this chapter examines the results from the demographic portion of the regulatory survey. These results will be analyzed against the demographic results from the 2002 USDA census. The second section of this chapter is devoted to examining how producers view the regulatory environment. Section three of this chapter provides results on the regulatory compliance costs. The regulatory environment's effect on technological choice and managerial issues is examined in section four. Section five of this chapter presents an estimate of the cost that the regulatory environment is having on producers' operating cost with the use of information developed from the producers' survey. The last section of this chapter looks at how the tree fruit, tree nut, and vegetable industries are being affected by the regulatory environment. In this section the top regulatory areas are identified for each of the industries and a ranking of each regulatory area is given in terms of impact.

### **General Demographics of Participants**

The first section of the producer survey was devoted to gathering demographic information from the producers. This demographic information is meant to give an overview of who the respondents are in the survey. The demographic results from the survey will be compared with the 2002 USDA Agricultural Census to verify if the respondents of the survey are representative of California Agricultural producers. There should not be an expectation that the results from the survey will exactly coincide with the census results because three years have lapsed since the census has been taken and the California agricultural environment is a dynamically changing industry. In that time the demographic distributions may have slightly changed. If the demographic data appears highly skewed, it could be an indication that some bias may exist in the survey.

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<sup>1</sup> This section was primarily prepared by Dr. Hurley.

**Figure 3-1: Business Organization of Survey Participants**

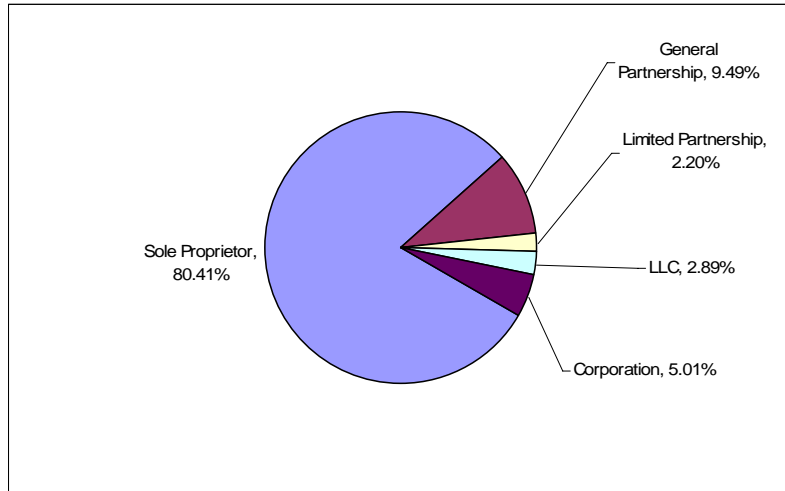


Figure 3-1 provides a look at the business organizations of the producers in the survey. The vast majority, 80.4 percent, of the respondents in the survey identified themselves as sole proprietorships. The survey broke-up partnerships into two major types—limited versus general partnerships. General

partnerships exceeded the limited partners by a factor of four where 9.5 percent of the respondents indicated they were from a general partnership, while 2.2 percent responded they were organized as limited partners. Five percent of the respondents identified themselves as corporations. The distribution of the business organization of the producers in the survey mirrors very closely the results seen from the 2002 Agricultural Census. The 2002 Census found that 80.9 percent of the state producers are sole proprietorships, 11.2 percent are partnerships, and 6.4 percent are corporations.

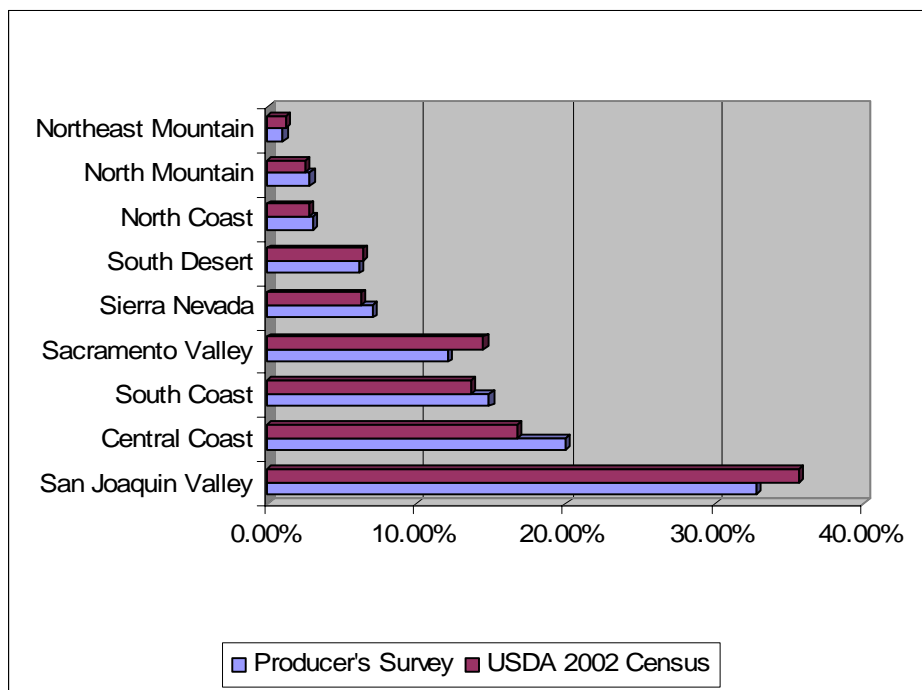
Question three of the regulatory survey asked what were the top three revenue-producing agricultural products grown on the producer's operation. Seventy-one percent of the producers responded that they produced only one product, twenty-one percent produced two products, and seven percent gave three products. Out of the approximately three hundred commodities produced in California, the survey managed to directly capture 152 commodities. Appendix C shows the different commodities that are clearly represented in the survey. Table 3-1 takes those commodities and distributes them across twenty-one different industries. Since only the top three were queried, these numbers represent only the lower end of the representation by each industry. The livestock industry had the greatest representation with 338 producers. Rounding out the top five industries represented in the survey were the grape industry, the nut industry, the grains, grasses, seeds and fiber for non-human consumption industry, and the citrus industry. At

the other end of the spectrum, the melon industry had four representatives and the aquaculture industry had six representatives.

**Table 3-1: Number of Industry Representatives from the Survey**

Industry	Number	Industry	Number
Livestock—Cattle, Hogs, and Dairy	338	Horticultural	41
Grapes	247	Human Consumption—Grain, Grasses, Seeds, and Fibers	41
Nuts	244	Vegetable—Leafy	27
Nonhuman Consumption—Grain, Grasses, Seeds, and Fibers	195	Poultry	26
Citrus	190	Berries	23
Fruit—Other	173	Timber	19
Other Animals and Insects	98	Vegetable—Root	15
Stone Fruit	93	Vegetable—Other	15
Horses	82	Aquaculture	6
Fruit—Deciduous	70	Melons	4
Vegetable—Vines	44		

**Figure 3-2: Distribution of Participants across Regions of California**

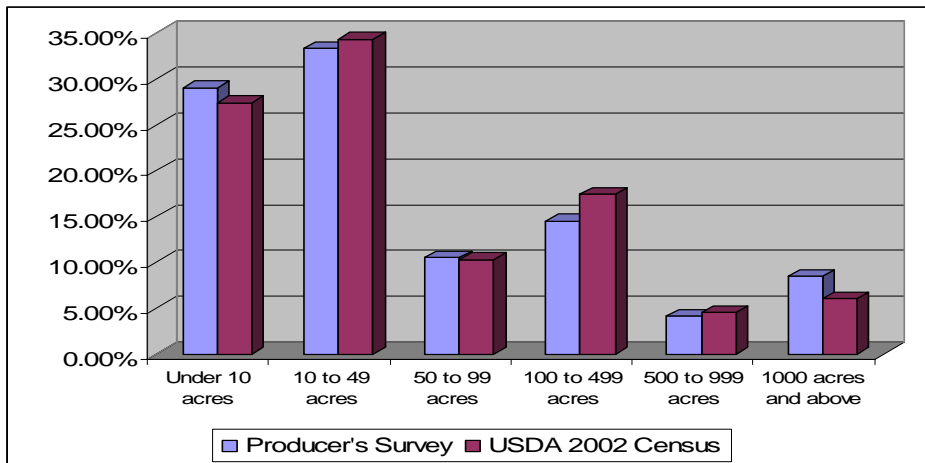


California has been categorized into nine regions of production by Johnston. These nine regions are: Region 1, North Coast; Region 2, North Mountain; Region 3, Northeast Mountain; Region 4, Central Coast; Region 5, Sacramento Valley;

Region 6, San Joaquin Valley; Region 7, Sierra Nevada; Region 8, South Coast; Region 9, South

Desert. Table D-1 in Appendix D shows how each of the fifty-eight counties are categorized into these nine regions. Using the nine region classification provided by Johnston, Figure 3-2 shows the regional distribution of the producers in the regulatory survey and from the 2002 USDA Census. All the regions of the state are represented in the survey. There were only two counties that did not respond to the survey—San Francisco County and Mono County. Comparing the regional distribution from the producer’s survey with the regional distribution from the USDA Census shows that the survey distribution closely mirrors what was found in the census. The producer’s survey appears to be slightly skewed to the coasts and away from the valley, but the differences are not extreme. This small difference may be an indicator that the coast has more interest in the regulatory environment in California in comparison to the valley. As you might expect, the largest amount producers in the study, 32.8 percent, are from the San Joaquin Valley. The Central Coast had the second highest percentage of respondents. The smallest share of respondents came from the Northeast Mountain and the North Mountain.

**Figure 3-3: Distribution of Survey Respondents and 2002 Census Respondents across Acres**



The survey had a wide array of responses for the number of acres the participants of the survey are farming. The smallest farm had only one acre while the largest

farm controlled 23,000 acres. The average for all the participants was 324 acres. In the 2002 USDA Census, the average acreage was 346 acres. This implies that the results may be skewed slightly to producers with smaller acreage. Examining Figure 3-3 shows that the producers’ survey has roughly the same distribution as the 2002 USDA Census. Producer’s who farm over thousand acres are representative slightly higher by the survey, while producers in the range of



100 to 499 acres are slightly less than the census. The biggest representation in the survey is coming from the smaller producers.

**Figure 3-4: Distribution of Survey Respondents by Gross Farm Income**

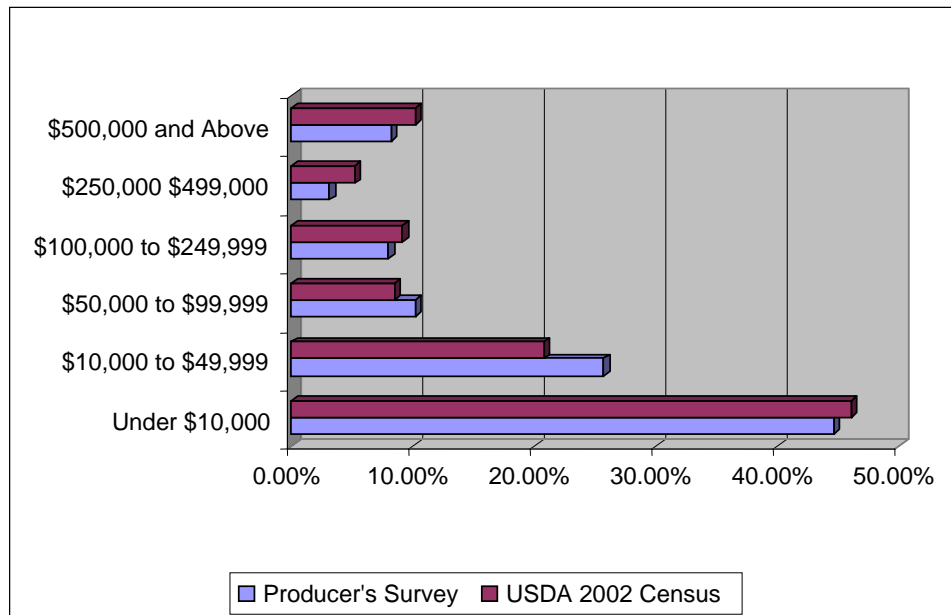


Figure 3-4 presents the distribution of producer in the survey by gross farm income and compares it to the census data. The highest percentage of respondents at 44.63 percent came from the under \$10,000 income

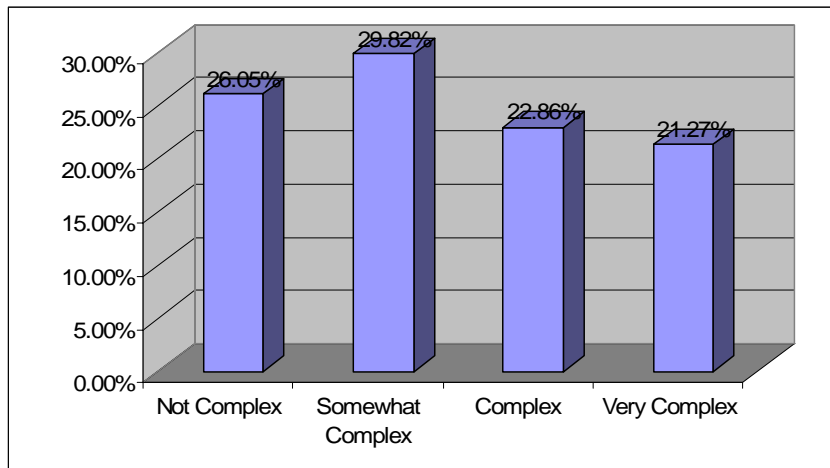
bracket. The least represented group in the survey is producers with an income range between \$250,000 to 499,999. It appears from the figure that producers in the \$10,000 to \$99,999 income range had a higher probability of responding to the survey in comparison to the other income brackets. Excluding the producers in the \$10,000 to \$49,999 income bracket, the percentage distribution from the census and the producer’s survey in each income category is within 2.1 percent of each other. With this slight skew in the data, it is possible that the higher response rate is occurring because the regulatory environment is having a greater effect on these producers.

Other findings in the demographic portion of the survey were that producers on average allocate approximately two-thirds of their gross income to variable cost and one-third to fixed cost. Approximately eight percent of the producers in the survey produce some form of organic. Nearly ninety-two percent of the participants in the survey identified themselves as operating a family farm/ranch.

## Producers Views of the Regulatory Environment

Part two of the survey examined questions regarding the regulatory environment. The questions in this section of the survey looked at four specific issues—the complexity of the regulatory environment, duplication of effort between different regulatory bodies, the impact of different regulatory areas, and the impact of the different regulatory costs.

**Figure 3-5: Producers' View of the Complexity of the Regulatory Environment**



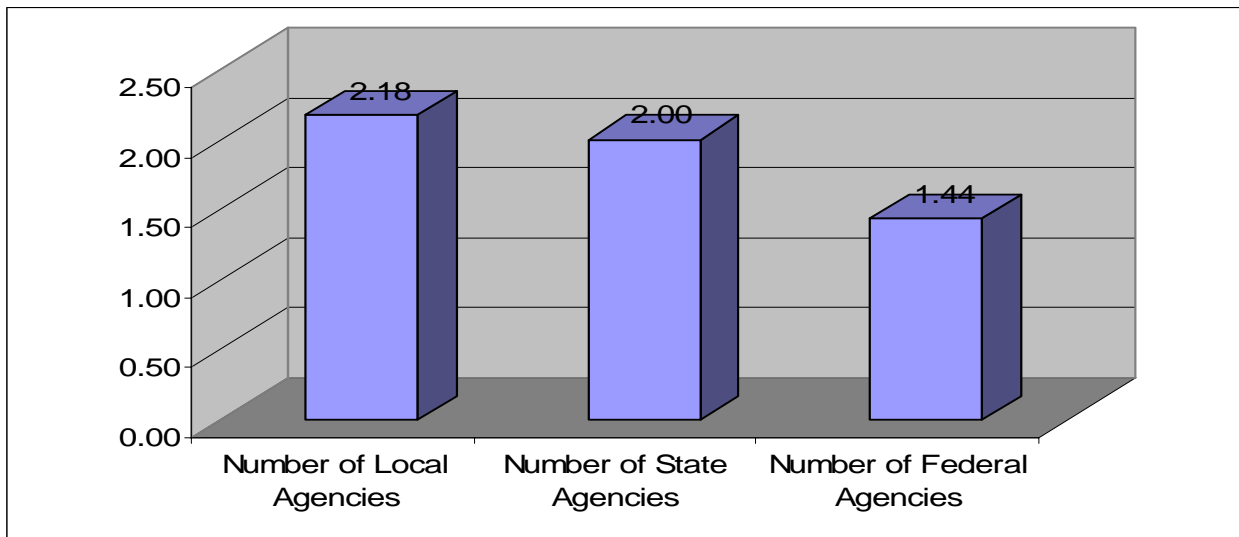
The first question in section two of the survey examined the complexity of the regulatory environment. The question gave four levels that the producer could choose from. These levels were Not Complex, Somewhat Complex, Complex, and

Very Complex. Figure 3-5 provides the results from this question. As can be seen from the figure, only twenty-six percent of the participants in the survey identified the regulatory environment as Not Complex. On the other extreme, over twenty-one percent of the producers indicated that the regulatory environment is Very Complex. Nearly thirty percent of the respondents found the regulatory environment Somewhat Complex, while approximately twenty-three percent found the regulatory environment Complex. Appendix E provides the producer's view of the complexity of the regulatory environment by industry, region, and income.

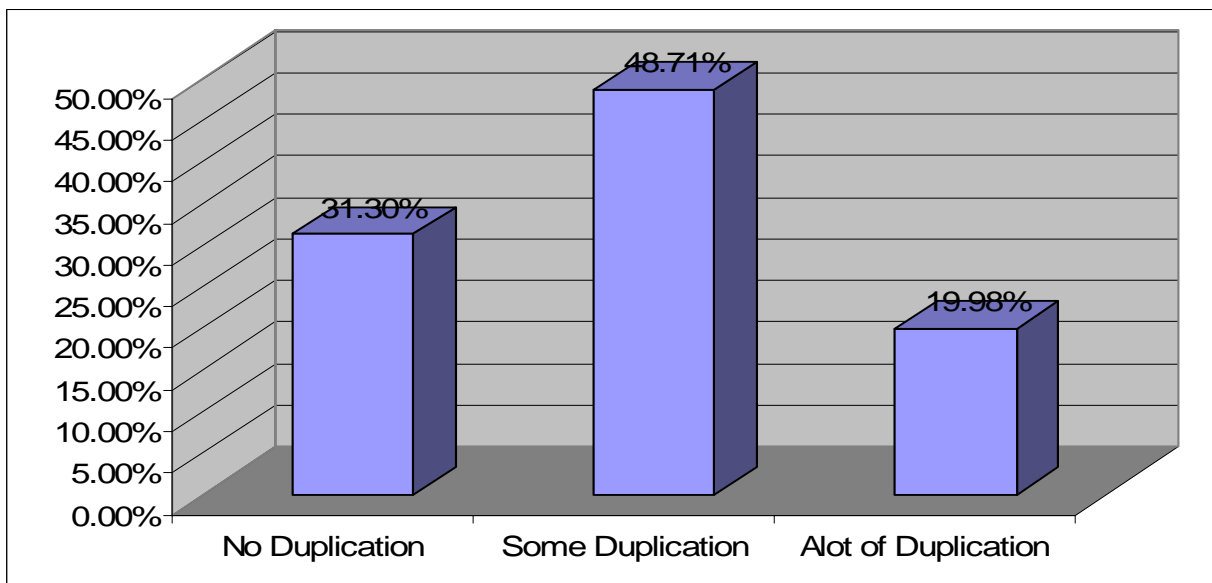
In the second section of the regulatory survey there were a few questions enquiring about the number of local, state, and federal agencies that the producers deal with and whether the producers perceived duplication in effort from these agencies. The results to these questions are represented in Figures 3-6 to 3-8. On average, producers have contact with 2.18 local agencies, 2.00 state agencies, and 1.44 local agencies. Just under a third of the producers found no duplication of effort between these agencies. Nearly fifty percent believe that there is some

duplication of effort, while approximately twenty percent believe there is a lot of duplication of effort between the agencies. This duplication is perceived the highest at the local level where seventy percent of producers found duplication at the local level and lowest at the federal level at fifty-one percent. Nearly sixty-five percent responded that they perceived duplication of effort at the state level. In all cases over fifty percent of the respondents found duplication at all levels of agencies.

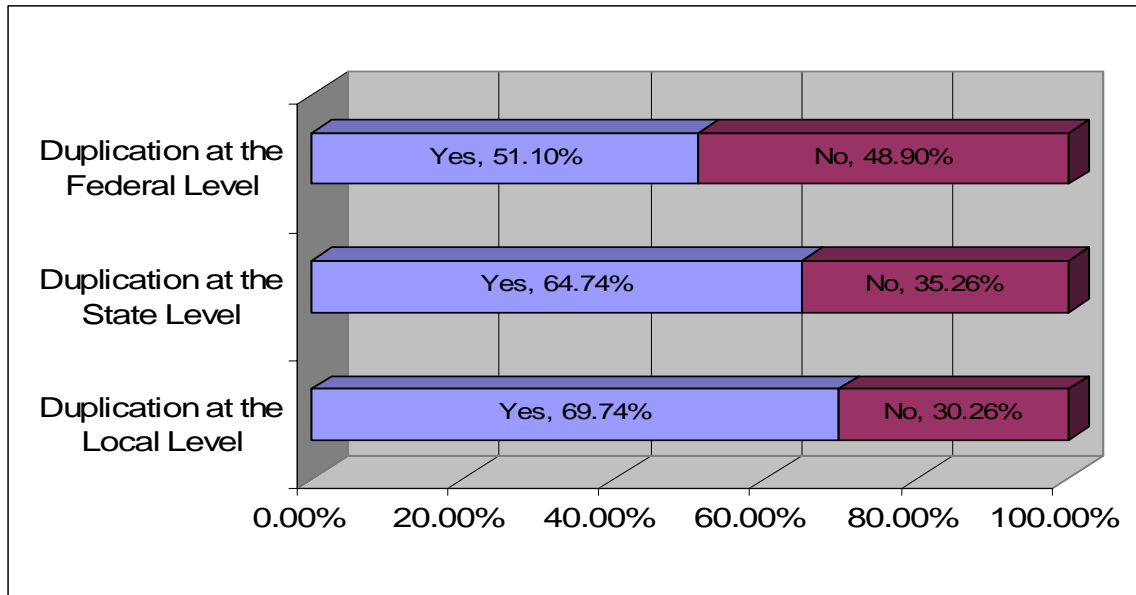
**Figure 3-6: Average Number of Local, State, and Federal Agencies the Producers Interact With**



**Figure 3-7: Perceived Duplication between Federal, State, and Local Agencies**



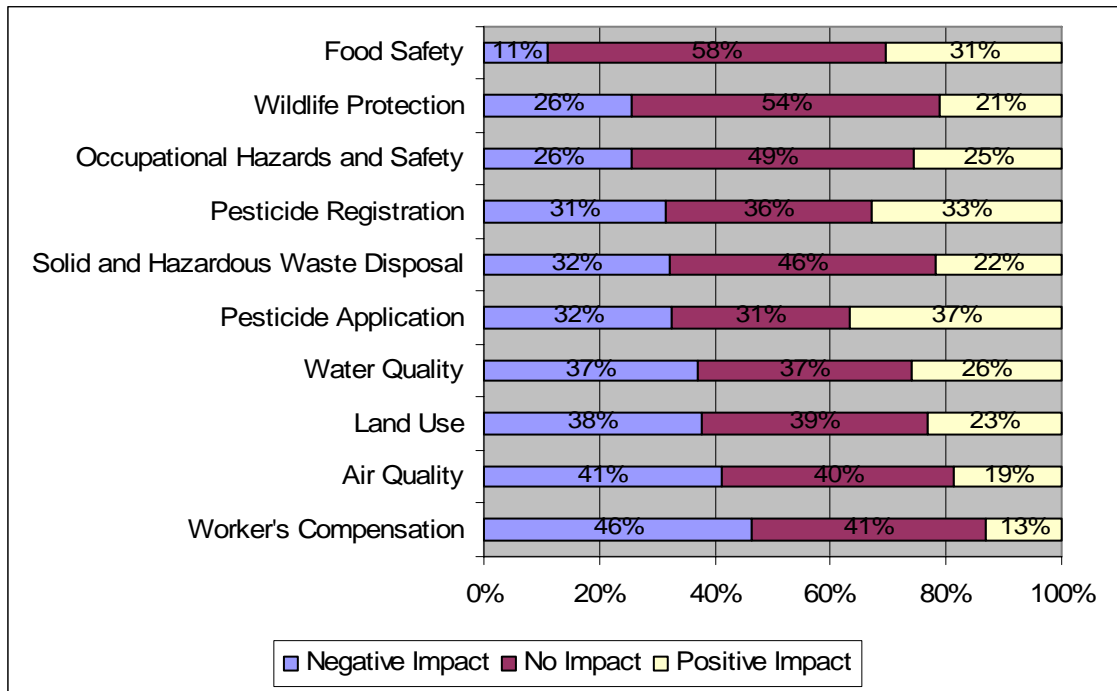
**Figure 3-8: Percentage of Respondents Finding Duplication at the Local, State, and Federal Level**



Regulations can have positive impacts, negative impacts, and no impacts on producers. This section of the study examines ten regulatory areas that were identified by the focus group which was discussed in the methodology section of the report. Producers were asked to identify the type of impact that each area had on their financial, operational, and managerial aspects of production. While producers seem to have no trouble with identifying the type of impact each regulatory area is having on their operation, they seem to have had difficulty ranking the impacts of each of these regulatory areas.

In Figure 3-9, Worker's Compensation at forty-six percent had the highest percentage of producer's indicating it had a negative impact on their financial, operational, and managerial aspects of production. Air quality regulations ranks second in negatively impacting the producer with forty-one percent identifying that this area had a negative impact on their operation. The other three areas that round out the top five negative impacting areas are land use regulations, water quality regulations, and pesticide application regulations. The regulatory area of food safety had the lowest amount of producers indicating a negative impact.

**Figure 3-9: Impact of Different Regulatory Areas on the Producers**



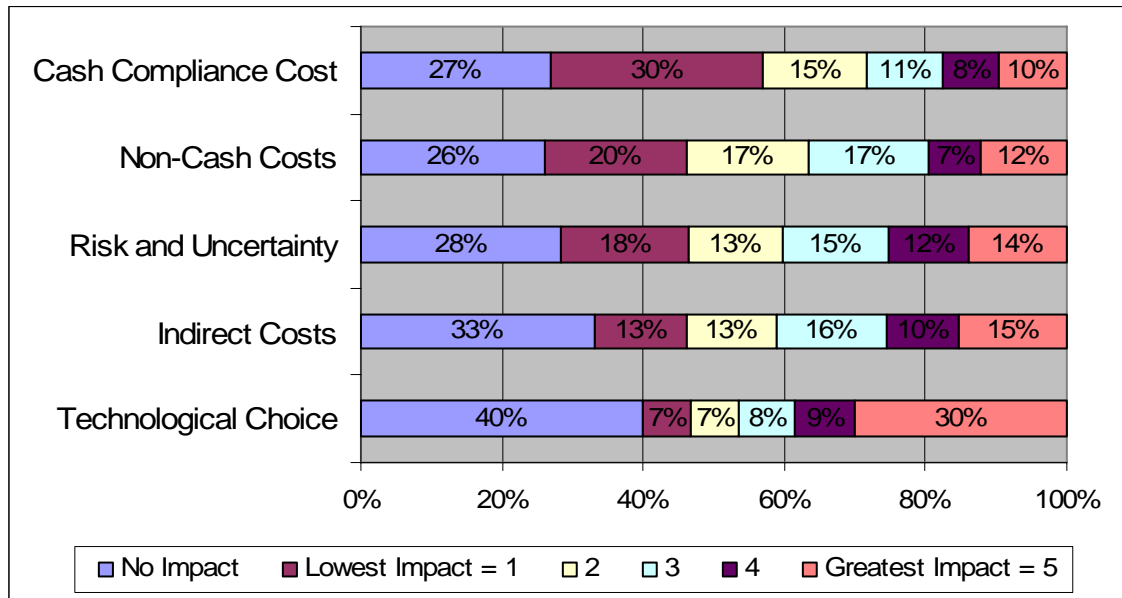
Examining the impacts on the positive side shows that the regulatory area of pesticide application had the largest perceived positive impact at thirty-seven percent. This was the only regulatory area to get over a third of the respondents. At the opposite side of the spectrum, only thirteen percent of the producers believed that workers' compensation had a positive impact upon their operation. Pesticide registration and food safety regulations round out the top three regulatory areas positively impacting producers at thirty-three and thirty-one percent respectively.

Two regulatory areas garnered over fifty percent of the producers indicating no impact. These areas were food safety and wildlife protection. Pesticide application had the lowest percentage of producers indicating that it had no effect. In many cases the No Impact response had the highest percentage for each regulatory area. This should be expected because some regulatory areas may not have an impact on the particular producers. For example, you would not expect pesticide application regulations to have a noticeable effect on horse producers. This would imply that it would be valuable to look at these regulatory areas on an industry-by-industry basis.

There are a few key observations that can be taken from Figure 3-9. The first observation is that there are a group of producers who acknowledge the value of having regulations. The second observation is that no regulatory area had a negative impact on over half the producers. The third observation is that if you exclude food safety and wildlife protection, over fifty percent of the producers are either negatively affected or positively affected by the different regulatory areas. Hence, regulations do have a noticeable effect on producers. For a look at how each of these regulatory areas affects producers in different industries, income brackets, and regions, see Appendix F. In the section below, an in-depth analysis will look at how the tree fruit, tree nut, timber, and vegetable industries are affected by each of these areas.

Five types of regulatory costs were investigated in the survey—cash compliance cost, non-cash costs, risk and uncertainty, indirect costs, and technological choice. Cash compliance cost were defined as out-of-pocket costs for the producers, while the other four costs are more like opportunity costs where they do not necessarily cause a specific cash outlay to the producer. Producers were asked to rank these costs where a zero indicated no impact, a one indicated the lowest impact, and a five indicated a positive impact. Figure 3-10 shows that costs due to technological choice restrictions had the greatest perceived impact on producers' costs. Technological choice had also the highest percentage of producers indicating no impact. These two seemingly contradictory results tell us that if technological choice is a factor, then it is a major factor in your cost. But, there is a large group of the producers where technological choice is not being affected by regulations. Indirect costs and risk and uncertainty had the second and third highest impacts. Non-cash costs and Cash costs were ranked by the producers as having the least impact on average. The results from this question have potentially interesting implications. Except for cash costs, all the other costs from this question are costs that do not have a specific cash outlay to the producer. This would imply that the highest impacting costs are non-cash related. Hence any estimation based on cash costs would be an underestimate of what the true cost of regulations are. To get at these costs, more advanced techniques would need to be employed in comparison to a general survey.

**Figure 3-10: Producers' Views of Regulatory Compliance Cost**



**Figure 3-11: Producers' Capital Investment over the Last Five Years**

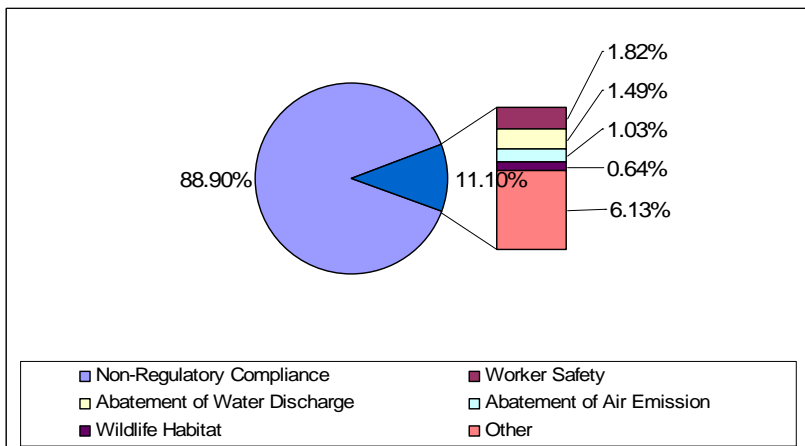
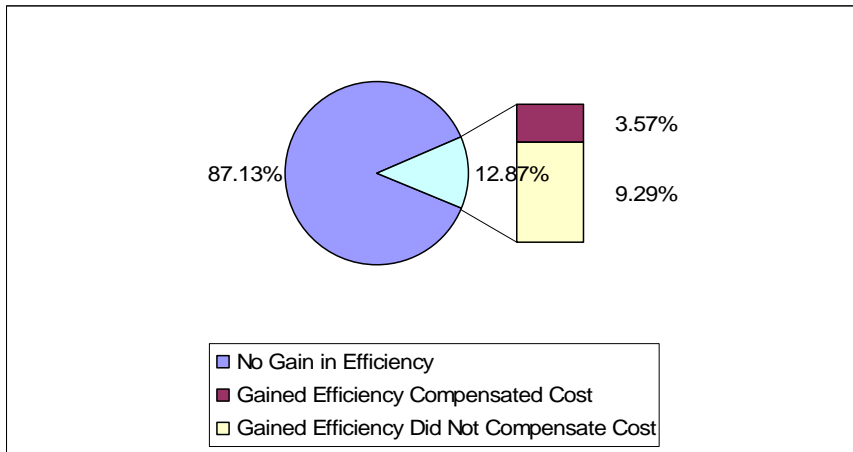


Figure 3-11 shows how much of the producers capital investment goes to regulatory compliance and how that money is split between different regulatory compliance issues. In the last five years, producers from the survey allocated 11.10 percent

of their capital expenditure to regulatory related capital upgrades. This equates to one in every nine dollars of capital investment goes towards regulatory compliance. Of that dollar that is allocated towards regulatory cost, sixteen percent is allocated to workers safety; thirteen percent goes to abatement of water discharge, nine percent to abatement of air emissions, and six percent towards providing wildlife habitat. The majority of money spent on capital investments for regulatory environment is going to other issues than the ones listed.

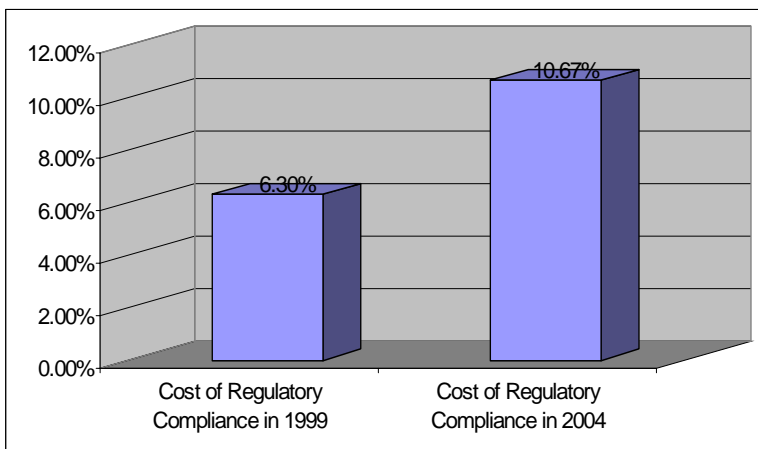
**Figure 3-12: Gain in Efficiency Due to Capital Investments Needed For Regulatory Compliance**



When a capital investment is made, there is a possibility for the producer to experience an increase in efficiency that accompanies using newer equipment. If this increase in efficiency was large enough, the capital

investment could be offset by the gains in efficiency. This would imply that the capital investment would benefit the producer, which in turn, would mean that the producer benefits from the regulation causing a capital improvement. Producers were asked in the survey to identify whether the capital investments they made due to regulatory compliance led to any gains in efficiencies. Figure 3-12 shows that most producers, 87.13 percent, did not believe that they gained any efficiency by making the capital improvement due to regulatory compliance. Out of the 12.87 percent of producers who believed they gained efficiency from making the capital improvements, over seventy percent believe that the gain in efficiency did not compensate the increase in cost. Only 7.68% of the producers in the study received cost share assistance for improving capital equipment to meet regulatory standards. These results would suggest that most producers are not directly benefiting from regulatory induced capital investment.

**Figure 3-13: Percentage of Operating Cost Devoted to Regulatory Compliance**



Producers were asked to indicate what percentage of their operating cost was allocated to regulatory compliance in 1999 and 2004. As can be seen in Figure 3-13, in the past five years the producers have indicated an increase in the cost of

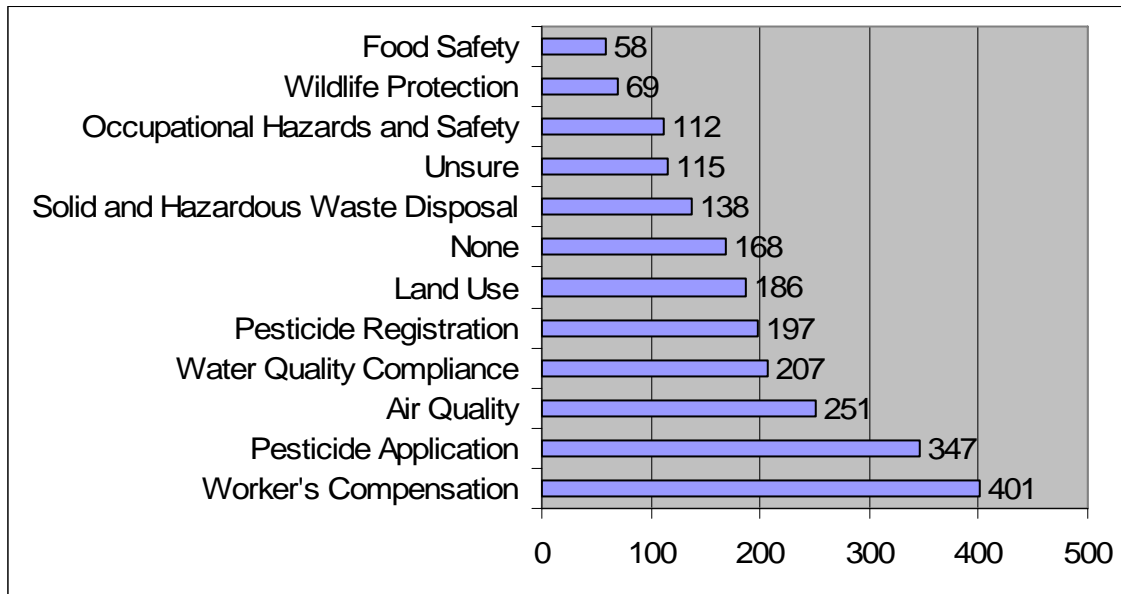


regulatory compliance. The producers in the survey indicated that the percentage of operating cost devoted to regulatory compliance in 1999 was 6.30%. In 2004, this percentage has increased to 10.67%, which represents a sixty-nine percent increase in the last five years.

In section two of the survey a question was asked regarding how differing regulatory areas are impacting the producers' financial, operational, and managerial aspects of their farm/ranch. In section three of the survey the producers were asked to identify the top three regulatory areas they believe were causing an increase in their operating cost. This question used the same areas that were used in section two except to other options were given—None and Unsure. While the question in section two examined both cash and non-cash costs, this question only examines cash cost. Comparing results between these two questions should be interesting because if the relative rankings are the same that would suggest that the operational costs due to regulations is the dominating factor in producers' views towards the regulatory environment. If on the other hand, the relative rankings change, this would suggest that there are non-cash costs from the regulatory areas which are important but do not necessarily affect the producers bottom-line.

Figure 3-14 provides the results to this question. As in the previous section, workers compensation is identified as the top regulatory area affecting producers. Pesticide application moved up from being ranked fifth in the previous section, to ranking second in terms of operational costs. Air quality regulations moved from being the number two to the number three ranked regulatory area. Water quality compliance remained at the number four ranking in both sections. Pesticide registration moved into the top five from being ranked number seven in regulatory areas impacting producers. Land use, which was ranked number three in negative impacts, ranks six in increasing operating cost. Food safety, wildlife protection, occupational hazards and safety, and solid and hazardous waste disposal maintain their relative ordering in both questions. These results suggest that there are some non-cash costs that are having an effect on the producers enough to change the relative ranking of some of the regulatory areas. This confirms that the non-cash related compliance costs seen in the end of section two do have a significant effect on producers.

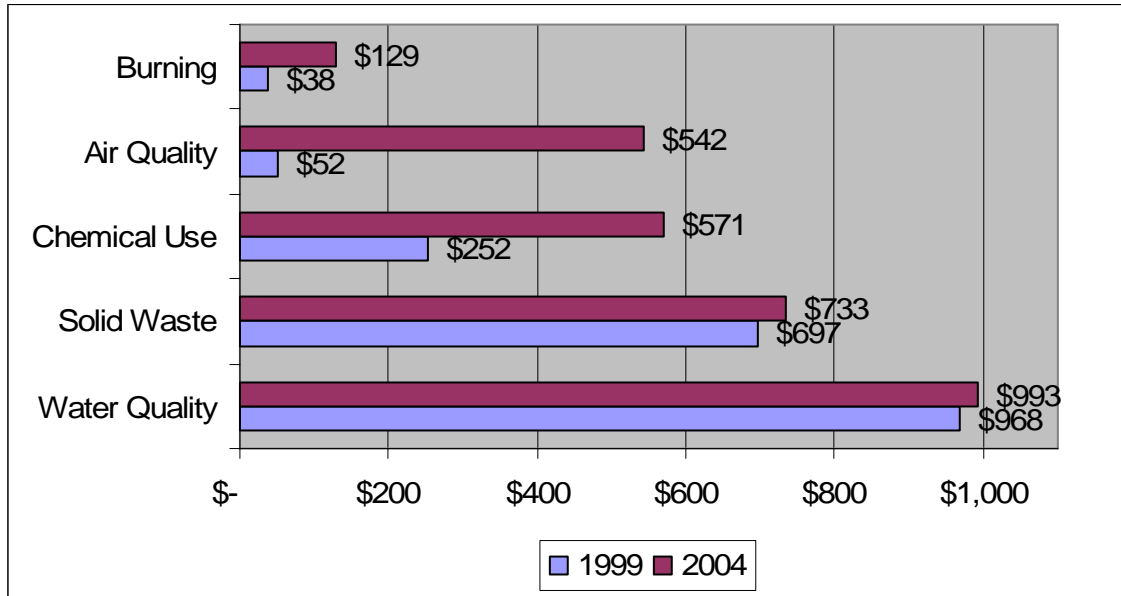
**Figure 3-14: Number of Producers Who Believe Operating Costs Have Increased Due to Regulatory Area\***



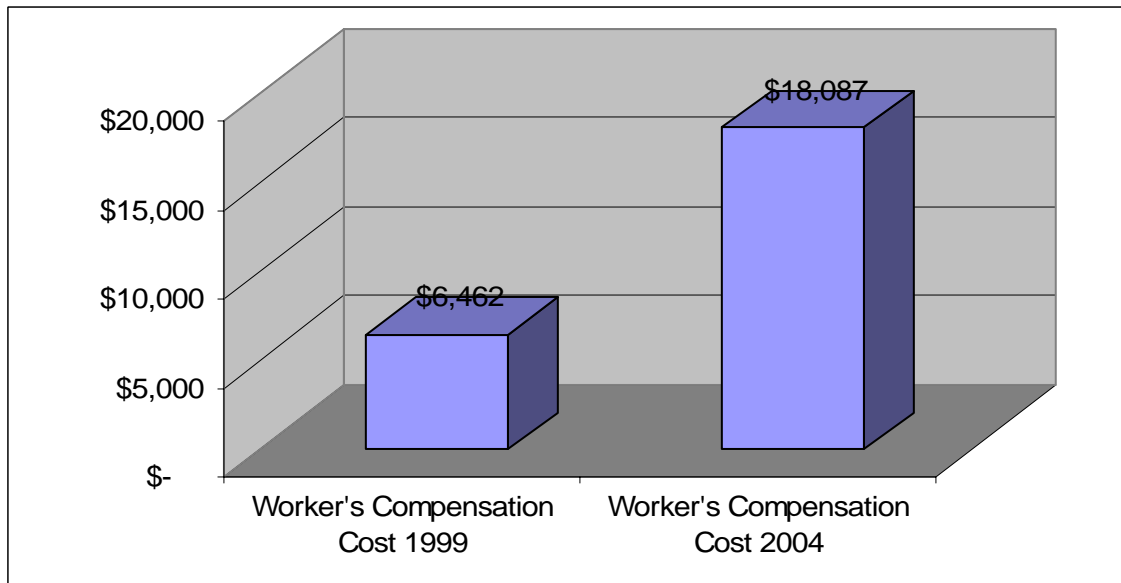
\*Producers had the opportunity to choose up to three of these areas.

Figures 3-15 and 3-16 provide the average cost reported by producers for various permits, fees, and workers' compensation costs for both 1999 and 2004. The largest fees paid by producers are water quality fees. These fees were \$968 in 1999 and increased to \$993 in 2004 representing an increase of 2.6 percent. Solid waste fees increased approximately twice that percentage at 5.2 percent. The lowest fees that producers paid were for burning permits. In 1999, these fees averaged \$38 and have increased to \$129 in 2004. This represents a 240 percent increase in costs. This percentage increase is small in comparison to the 940 percent increase in air quality fees that occurred between 1999 and 2004. Chemical use fees have increased by only 125 percent. In this same time period, workers' compensation has increased on average by \$11,625 representing a 180 percent increase. It is evident from the survey that many fees over the last five years have substantially increased. With an average cost over \$18,000, it is no wonder why workers' compensation ranks as the highest issue in the previous questions.

**Figure 3-15: Average Costs of Regulatory Permits in 1999 and 2004**



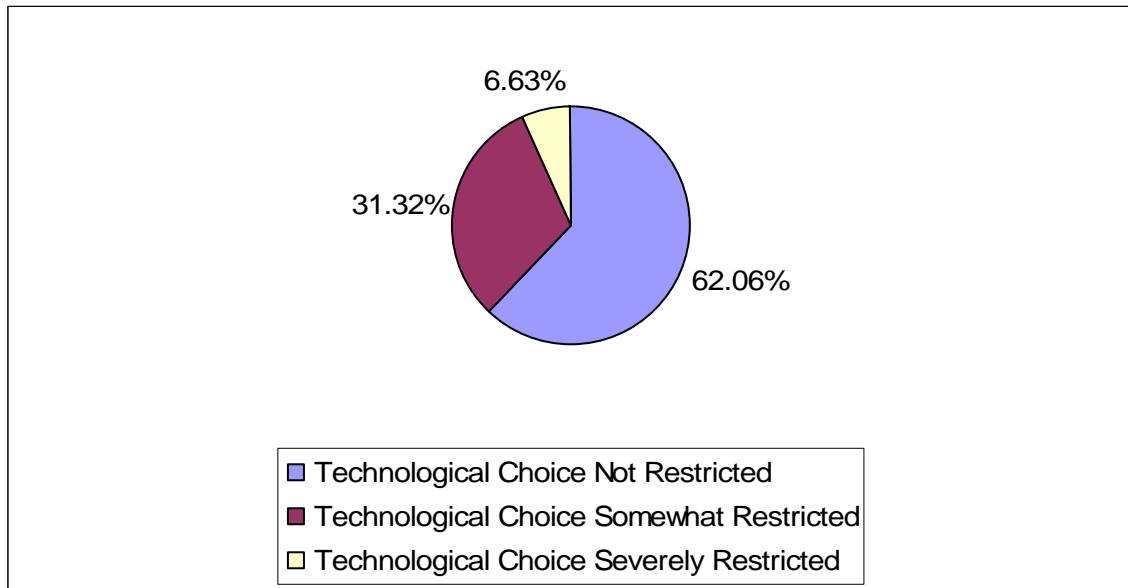
**Figure 3-16: Average Workers' Compensation Costs in 1999 and 2004**



**Producers' View on How the Regulatory Environment is Affecting Their Technological Choices and Managerial Decisions**

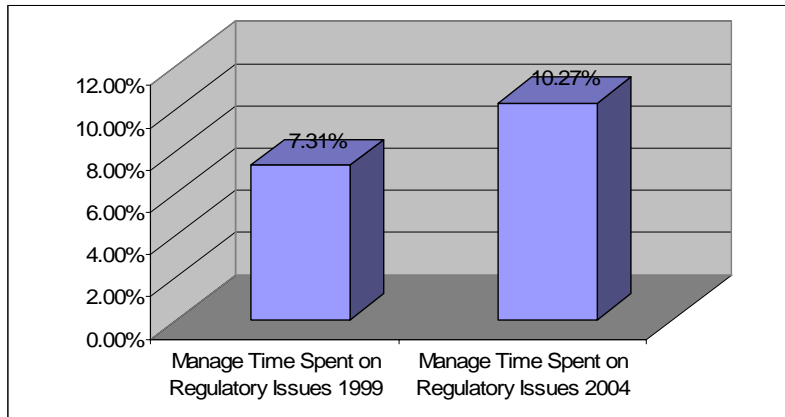
This section of the report examines how producers view the regulatory environment and its effect on their technological choices and managerial decisions. These results are pulled from the last two sections of the producers' survey.

**Figure 3-17: Level of Restriction on Technological Choice Due to the Regulatory Environment**



In section two of the regulatory survey, the producers were asked to rank different compliance costs associated with the regulatory environment. One of the compliance costs examined related to technological choice. It was previously seen that thirty percent of producers believed that costs related to restrictions on technological choice had the greatest impact in relationship to the other costs examined. Another forty percent said that the restrictions in technological choice had no impact. This question was further investigated in section four of the survey where the producer was asked to identify whether the regulatory environment did not restrict their technology choices, somewhat restricted it, or severely restricted it. Figure 3-17 shows that around sixty-two percent of producers believe that the regulatory environment in California is not restricting their technological choices. Approximately six and a half percent found their technological choices severely restricted. This result coupled with the one in section two would imply that there is a group of producers who found their technological choices were somewhat restricted and that the costs associated with this issue had the greatest impact.

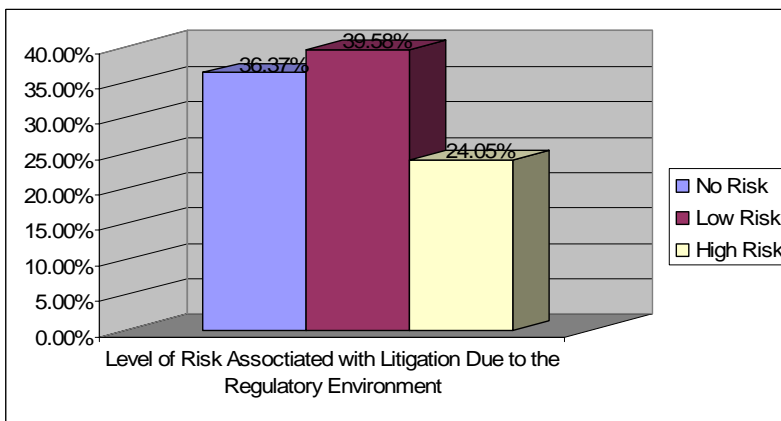
**Figure 3-18: Percentage of Management Time Spent on Regulatory Issues in 1999 and 2004**



Producers were asked whether the regulatory environment affected their ability to manage their farms. They were also asked how much of their management time was spent on regulatory issues in 1999 and 2004. Around sixty-one percent

of the producers believe that the regulatory environment has affected their ability to effectively manage their farms. Producers have seen a forty-percent increase in their management time allocated toward regulatory issues. Figure 3-18 shows that producers estimated on average that in 1999, they spent 7.31 percent of their time on regulatory issues. This increased to 10.27% in 2004.

**Figure 3-19: Level of Risk Associated with Litigation Due to the Regulatory Environment**



In the past five years, 32.21% of the producers found a greater need to consult an attorney concerning regulatory compliance. Figure 3-19 shows that approximately forty percent of the producers indicated that they view the risk

associated with litigation due to the regulatory environment as low. Another twenty-four percent found this risk level to be high. Thirty-six percent of the producers found no risk of litigation due to the regulatory environment.

The producers were asked to indicate whether some of their management options have been reduced due to the regulatory environment. Specifically, the four management options investigated were: 1) choice of production inputs, 2) flexibility in operational decision-making,

3) number of crops that can be grown, and 4) land use choices. Figure 3-20 provides a summary of the results from this question. The management option affected the most by the regulatory environment is related to land use choices. Over forty-five percent of the producers indicated that their land use choices have been reduced by the regulatory environment. At forty-five percent, flexibility in operational decision-making was slightly below land use choice. The management option that is the least reduced of the four investigated was the number of crops that can be grown. Only sixteen percent of the producers believe that the regulatory environment is reducing the number of crops they can produce.

**Figure 3-20: Areas of Reduced Management Options Due to the Regulatory Environment**

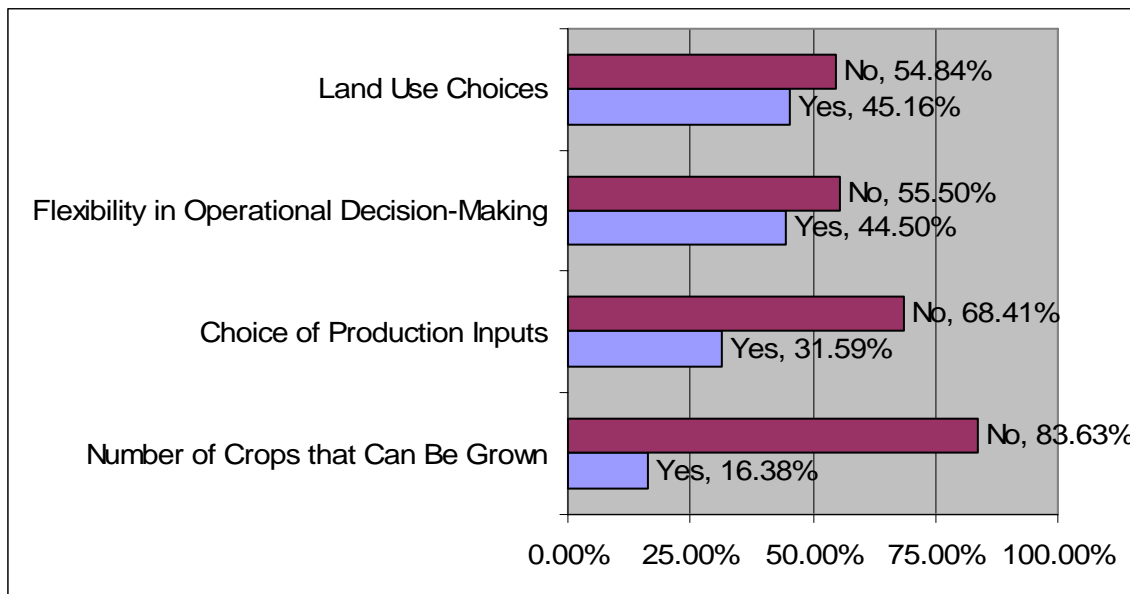
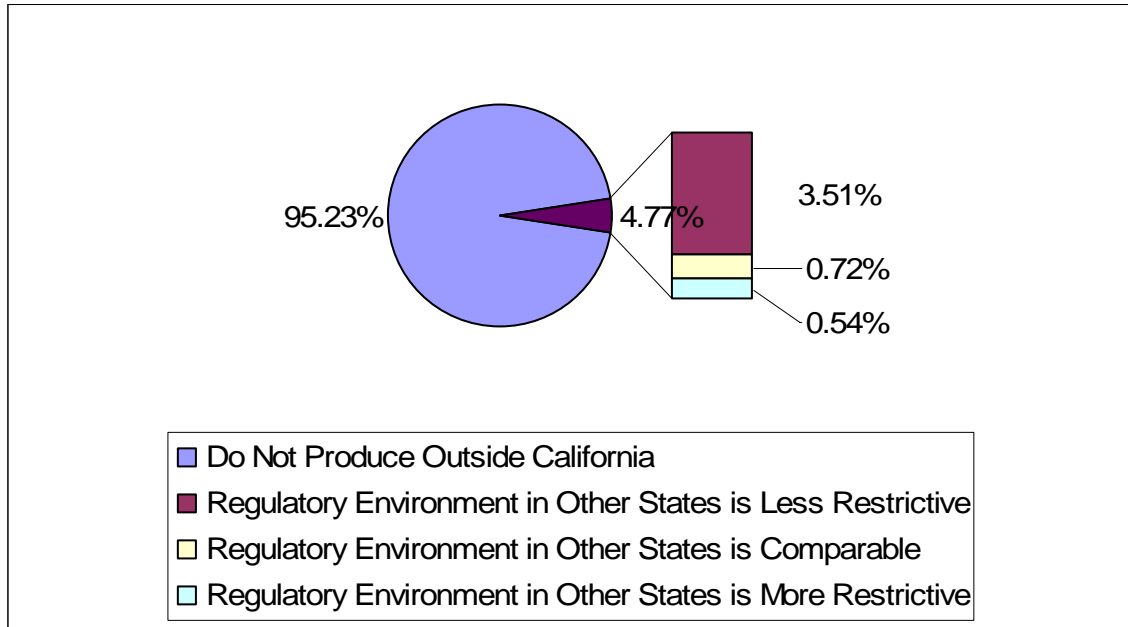


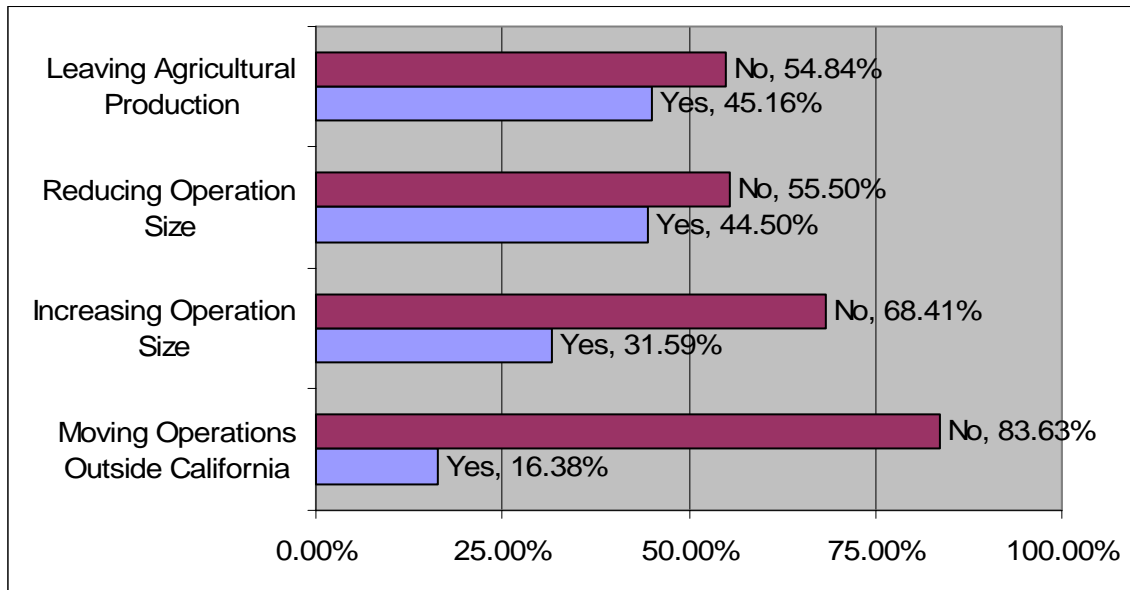
Figure 3-21 provides a view of what percentage of producers in the survey has operations outside of California. It also shows how the producers who produce outside of the state compare the regulatory environment in California in relationship to the other states/countries. Almost all the producers in the survey produced strictly in California. Only 4.77 percent of the respondents produce outside of California. Of the group that does produce outside California, approximately seventy-four percent found the California regulatory environment more restrictive than the other state they are producing in. Only eleven percent of the producers found that California's regulatory environment is less restrictive.

**Figure 3-21: Comparison of the Restrictiveness of the California Regulatory Environment in Comparison to Other States**



One topic that the survey attempted to get at was the options producers have considered due to California’s regulatory environment. In the survey producers were asked if they have considered the following options—leaving agricultural production, reducing the size of their operation, increasing the size of the operation, and moving their operations outside of California. It appears that the option considered most by producers was leaving agricultural production. Figure 3-22 shows that over forty-five percent of those who answered the question mentioned that they have considered leaving agriculture. While leaving agriculture has the highest percentage of respondents answering yes, moving the operations outside of California was the lowest on the list of choices. Reducing operation size was considered a better option compared to increasing the size. It was also comparable in numbers to those who considered leaving agriculture altogether. What these results imply is that producers are more likely to exit the industry or prepare to exit the industry rather than increase their operational size to potentially gain economies of scale. With such a small amount of producers considering leaving California, it appears that producers would prefer to leave agricultural altogether rather than leave California.

**Figure 3-22: Management Options Considered Due to the Regulatory Environment in California**



**Estimation of the Cost of the Regulatory Environment on California Agricultural Producers**

In the previous sections of this report, results were given from a producers’ survey that examined how the California regulatory environment affects California agricultural producers. This section of the report presents results derived from the information above regarding the actual cost of the regulatory environment on California agricultural producers. The estimate from this section as explained in chapter two is only a lower bound on the cost of the regulatory environment. This estimate is for the costs that affect the producers operating cost and does not take into consideration any capital costs that are allocated towards regulatory compliance.

In the methodology section of chapter two an explanation was given on how the cost of the regulatory environment was estimated for this section. It outlined that three scenarios must be examined to obtain a clear picture of the regulatory cost because one of the main components in developing the cost came from an income range. Table 3-2 presents the incomes used for each scenario. Scenario one used the median point for each income bracket except for the last income bracket. The last income bracket was estimated. Hence, for those producers who indicated that their income was fewer than 10,000 dollars, they were allocated an estimated income of 5,000 dollars on average. Scenario two assumed that the producers’ incomes were at the lower end of the income bracket. This implies that a producer who chose the lowest income bracket was



assumed to have an income of zero. The third scenario used income estimates at the upper end of the income range. A producer, who chose the lowest income bracket under this scenario, was allocated an income of 9,999 dollars. It will be shown later that these three different scenarios provide estimates that are close to each other.

**Table 3-2: Incomes Used to Estimate Regulatory Cost under Three Different Scenarios**

<b>Farm Income Range</b>	<b>Scenario 1</b>	<b>Scenario 2</b>	<b>Scenario 3</b>
<b>Under \$10,000</b>	\$ 5,000	\$ 0	\$ 9,999
<b>\$10,000 - \$49,999</b>	\$ 30,000	\$ 10,000	\$ 49,999
<b>\$50,000 - \$99,999</b>	\$ 75,000	\$ 50,000	\$ 99,999
<b>\$100,000 - \$249,999</b>	\$ 175,000	\$ 100,000	\$ 249,999
<b>\$250,000 - \$449,999</b>	\$ 375,000	\$ 250,000	\$ 499,999
<b>\$500,000 +</b>	\$ 3,990,275	\$ 4,211,638	\$ 3,768,920

There are three questions on the producer survey that allow for an estimation of the cumulative cost of regulations to California agricultural producers. To obtain an estimate of the regulatory cost, it was necessary to use producers who answered all three questions. The first question needed was the farm income the producer earns in a year. The second question asked producers what percentage of their total income is devoted to operating costs. The third question asked the producers what percentage of their operating cost is devoted towards regulatory compliance. Table 3-3 shows that 199 producers answered all three questions that allow for an estimation of the regulatory cost. These producers represent almost sixteen percent of the original sample.

**Table 3-3: Distribution of Producers in Each Income Category**

<b>Farm Income Range</b>	<b>Number of Producers Used to Estimate Cost</b>	<b>Percent of Total</b>	<b>Number of Farms answering income question</b>	<b>Percent of Total</b>	<b>USDA 2002 Agricultural Census Results</b>
<b>Under \$10,000</b>	93	46.73%	561	44.63%	46.10%
<b>\$10,000 - \$49,999</b>	45	22.61%	323	25.70%	20.80%
<b>\$50,000 - \$99,999</b>	18	9.05%	129	10.26%	8.50%
<b>\$100,000 - \$249,999</b>	16	8.04%	101	8.04%	9.10%
<b>\$250,000 - \$449,999</b>	9	4.52%	40	3.18%	5.20%
<b>\$500,000 +</b>	18	9.05%	103	8.19%	9.90%
<b>All Incomes</b>	199		1257		

Table 3-4 above presents the six different income categories and shows the distribution of producers who were used to estimate the cost of the regulatory environment. This table also shows the percentage of producers who were in each income bracket from the producers' survey

and the percentage of producers who were in each income bracket in the 2002 USDA census. The information in this table can be used to gauge how representative the producers who are used for estimating the regulatory cost are in terms of the USDA census. Comparing the census distribution of farms by income class with the sample obtained from the producer survey shows that the producer used to estimate the cost is quite close in relationship to distribution. No percentage is off by more than 1.81 percent. This implies that the producers who answered all three questions appear to be closely distributed to the census results.

Table 3-4 presents the first estimate of the regulatory cost by farm income level. This table represents the first scenario explained above where producers are allocated to the median of the income bracket. Under this scenario, it is estimated that California producers spend approximately 2.2 billion dollars on regulatory compliance related to their operating costs. This equates to 6.41 percent of their farm income is used to comply with regulations.

**Table 3-4: Estimated Regulatory Cost by Farm Income for Scenario 1**

<b>Farm Income Range</b>	<b>Regulatory Cost</b>	<b>Average Regulatory Cost per Farm</b>	<b>Regulatory Cost as a Percent of Farm Income</b>
<b>Under \$10,000</b>	\$ 9,306,511	\$ 262	5.24%
<b>\$10,000 - \$49,999</b>	\$ 39,190,084	\$ 2,447	8.16%
<b>\$50,000 - \$99,999</b>	\$ 30,816,042	\$ 4,708	6.28%
<b>\$100,000 - \$249,999</b>	\$ 112,659,422	\$ 16,078	9.19%
<b>\$250,000 - \$449,999</b>	\$ 82,966,217	\$ 20,721	5.53%
<b>\$500,000 +</b>	\$ 1,924,943,890	\$ 252,518	6.33%
<b>All Incomes</b>	\$ 2,199,882,166	\$ 28,570	6.41%

For farms with less than ten thousand dollars of annual farm income, it is estimated that these producers are paying approximately 9.3 million dollars which averages to 262 dollars per farm. These producers which make up approximately forty-six percent of the California farm population pay less than one half of a percent of the total regulatory cost. Farms that have an income above 500,000 dollars pay an estimated 1.9 billion dollars of their farm income to regulatory compliance. This represents nearly eighty-eight percent of regulatory costs are being paid by approximately ten percent of California producers. Producers in the range of 100,000 to 249,999 dollars pay the second highest amount of their income to regulatory expenses. This group represents nine percent of the producers in the state and they pay a little over five percent

of the total regulatory cost. While it appears that the second income bracket is paying more than the third and the fourth income bracket is paying more than the fifth, this relationship is occurring because the lower income brackets have more producers than the upper income brackets.

Table 3-4 above provides two other valuable looks at how the regulatory costs are broken-up by income. The first look is at the average regulatory cost for each farm income bracket. Producers who produce less than 10,000 dollars worth of agricultural commodities pay an average of 262 dollars per farm to comply with regulations. On the opposite side of the spectrum, producers in the highest income bracket pay an estimated 252,518 dollars per farm. As would be expected, as income increase so does the average amount paid by each farm.

The second item that is valuable to examine in the above table is the percentage of farm income that is allocated for regulatory compliance. While the average regulatory costs were increasing as farm income increased, this is not the case for the percentage of income paid. At 9.19 percent, producers with an income range between 100,000 and 249,999 dollars devoted the highest percentage of their total income to regulatory compliance. The second highest percentage paid was by the producers who earn 10,000 and 49,999 dollars. This group devoted 8.16 percent of their income. Producers at the highest income level paid 6.33 percent of their farm income to regulatory compliance. This was slightly below the overall average of 6.41 percent. Producers at the lowest end of the income spectrum devoted only 5.24 percent of their income to regulatory compliance. These results suggest that there are economies of scale that may be had in regulatory compliance cost by becoming a large producer, i.e., producers may gain relative cost savings by producing more in order to spread the regulatory costs across more output.

Scenario two is represented in Table 3-5. This scenario assumed that producers' income was at the upper end of the income range. In this table, information is provided on the total regulatory cost and the average regulatory cost by income bracket. Under this situation, the cost to California producers of regulatory compliance is estimated at 2.21 billion dollars. This equates to less than a fifteen million dollar difference than scenario one. The producers at the lowest income bracket paid an estimated 18.6 million dollars which equates to an average farm cost of 524 dollars. The largest income producers paid approximately 1.82 billion dollars of their

income to regulatory compliance. This implies an average farm cost of 238,510 dollars.

Comparing this result with the previous shows that under this scenario, the largest producers are paying less on average. The average regulatory cost per farm is increasing with each income level.

**Table 3-5: Estimated Regulatory Cost by Farm Income for Scenario 2**

<b>Farm Income Range</b>	<b>Regulatory Cost</b>	<b>Average Regulatory Cost per Farm</b>
<b>Under \$10,000</b>	\$ 18,611,162	\$ 524
<b>\$10,000 - \$49,999</b>	\$ 65,315,501	\$ 4,078
<b>\$50,000 - \$99,999</b>	\$ 41,087,645	\$ 6,278
<b>\$100,000 - \$249,999</b>	\$ 160,941,387	\$ 22,969
<b>\$250,000 - \$449,999</b>	\$ 110,621,401	\$ 27,628
<b>\$500,000 +</b>	\$ 1,818,160,484	\$ 238,510
<b>All Incomes</b>	\$ 2,214,737,580	\$ 28,763

The third scenario is represented in Table 3-6 which provides the total and average regulatory cost by income bracket. This scenario, which estimates producers' income at the lowest end of the income range, gives the lowest estimate of the total regulatory cost. Under this scenario, California producers are estimated to pay approximately 2.19 billion dollars. This represents less than a thirty million dollar difference between this estimate and the highest estimate. Producers in the highest income bracket are estimated to pay 2.03 billion dollars in regulatory cost. This averaged to 266,527 dollars per farm.

**Table 3-6: Estimated Regulatory Cost by Farm Income for Scenario 3**

<b>Farm Income Range</b>	<b>Regulatory Cost</b>	<b>Average Regulatory Cost per Farm</b>
<b>Under \$10,000</b>	\$ 0	\$ 0
<b>\$10,000 - \$49,999</b>	\$ 13,063,361	\$ 816
<b>\$50,000 - \$99,999</b>	\$ 20,544,028	\$ 3,139
<b>\$100,000 - \$249,999</b>	\$ 64,376,813	\$ 9,188
<b>\$250,000 - \$449,999</b>	\$ 55,310,811	\$ 13,814
<b>\$500,000 +</b>	\$ 2,031,731,667	\$ 266,527
<b>All Incomes</b>	\$ 2,185,026,680	\$ 28,377

Given the three scenarios examined above, a few interesting results should be noted. First, the estimated regulatory cost for producers is between 2.19 billion dollars to 2.21 billion dollars. It must be emphasized that this estimated range is a lower bound on the cost of regulatory

compliance that producers must pay. Due to limitations in the survey, no estimate was made for the capital costs that are incurred by producers due to the regulatory environment. The reason that this estimate of regulatory cost has such a tight range is because the largest producers are paying the lion's share of the regulatory costs. When you examine the percentage of income devoted towards regulatory compliance, many of the middle income brackets have higher percentages. The range on percentage of income allocated to regulatory cost is between 5.24 percent to 9.19 percent. It also appears that there are gains to be made in cost savings to being a large operation because economies of scale favor the larger producer in regards to regulatory compliance.

### **Regulatory Impact on the Forest Products, Tree Fruit, Nut, and Vegetable Crop Industries**

The previous sections examined the producers' survey results in aggregate and developed a cost of regulatory compliance that California producers must pay. It demonstrated how the regulatory environment is affecting the California agricultural industry as a whole. This section focuses on examining how the regulatory environment is affecting the key industries of this study—forest products, tree fruit, nuts, and vegetable crops. Specifically, three questions from the survey will be the focus of this section. The first question examined is the producers' view of the level of complexity of the regulatory environment in California. The second question looked at is from section two of the survey. It asked the producers to identify how each regulatory area was affecting them financially, operationally, and managerially. The third question from the survey analyzed on an industry basis is the question that asked the producers to identify the top three regulatory areas increasing their operational costs. By examining these three questions together, objective three of the project will be met.

The forest products, tree fruit, nuts, and vegetable crops industries were categorized into fourteen separate industries. The categorization of these industries is located in Appendix C. Table 3-6 identifies the number of producers in each industry that answered both questions that are the focal point of this section. The grape industry had the largest number of representatives with 195 producers. Eight of the industries were well represented with thirty producers or more, while six industries had thirteen or less producer representatives. The industry with the smallest representatives is the melon industry with only three producers. Caution should be taken when

interpreting the results for any industry below thirty producers due to the small number of respondents.

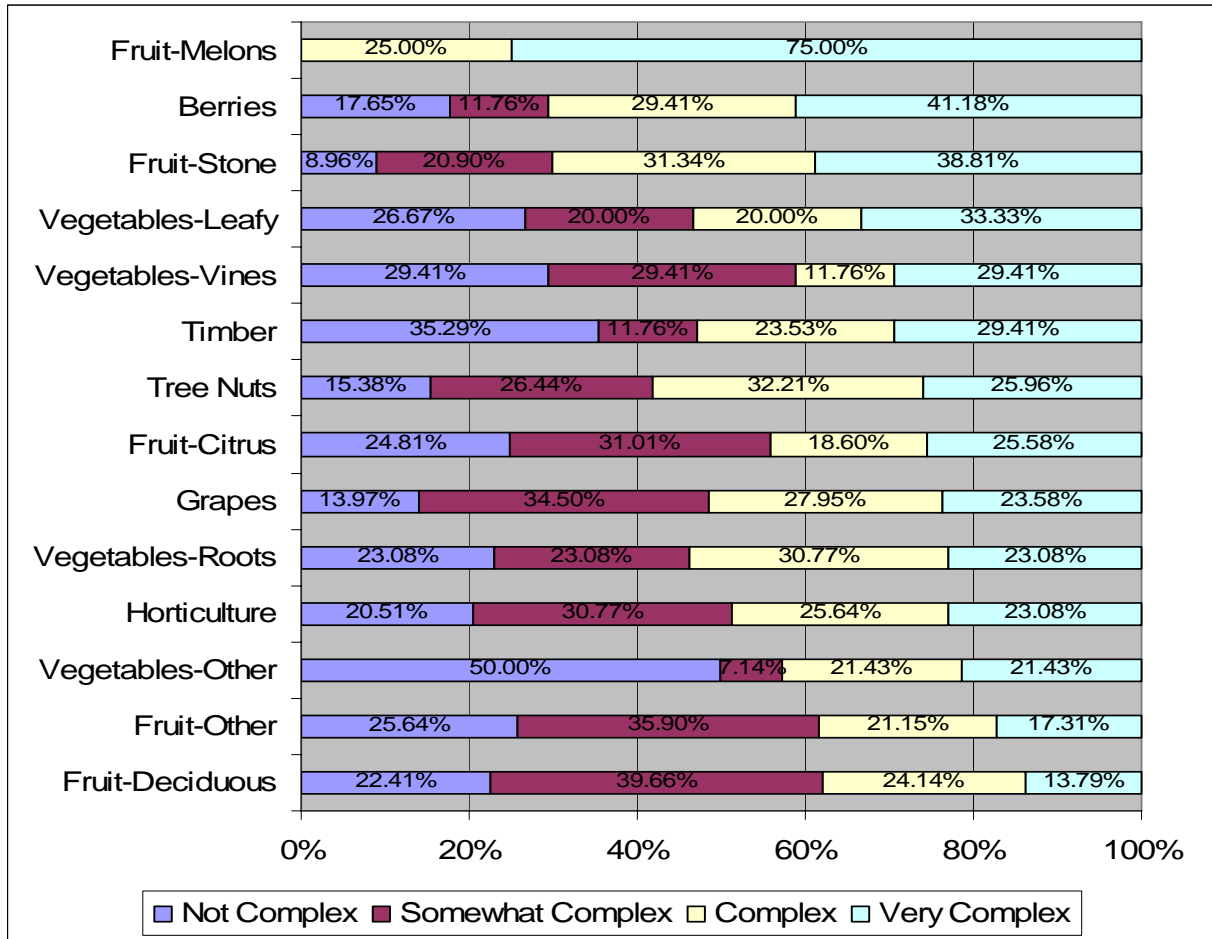
**Table 3-6: Number of Producers Representing Each Industry**

<b>Industry</b>	<b>Number of Respondents</b>	<b>Industry</b>	<b>Number of Respondents</b>
Fruit-Melons	3	Horticulture	33
Vegetables-Roots	8	Fruit-Deciduous	54
Vegetables-Other	12	Fruit-Stone	60
Vegetables-Leafy	12	Fruit-Other	134
Timber	17	Fruit-Citrus	111
Berries	13	Tree Nuts	188
Vegetables-Vines	30	Grapes	195

Figure 3-23 provides a view of how each industry viewed the level of complexity of the regulatory environment. There were eight industries that had over fifty percent of their producers identify the regulatory environment as either Complex or Very Complex. These industries were: the melon industry, the berry industry, the stone fruit industry, the leafy vegetable industry, the timber industry, the tree nut industry, the grape industry, and the root vegetable industry. Nine out of the fourteen industries had less than twenty-five percent of their producers indicating that the regulatory environment is Not Complex. The industry that had the highest percentage of producers who indicated the regulatory environment was Very Complex was the melon industry. The berry industry had the second highest percentage of producers that believed the environment was Very Complex. The deciduous fruit industry had the lowest percent of producers indicating Very Complex.

The vegetable industry denoted by other had the highest percentage of producers indicating the regulatory environment was Not Complex. This industry will also be denoted as the miscellaneous vegetable industry. This industry was made up of Indian and sweet corn producers, water cress, artichokes, and what CASS defines as other vegetables. Over a third of the timber industry producers indicated that the regulatory environment was Not Complex. Only nine percent of the stone fruit producers would classify the regulatory environment as Not Complex.

**Figure 3-23: An Industry-by-Industry View of the Complexity of the Regulatory Environment**

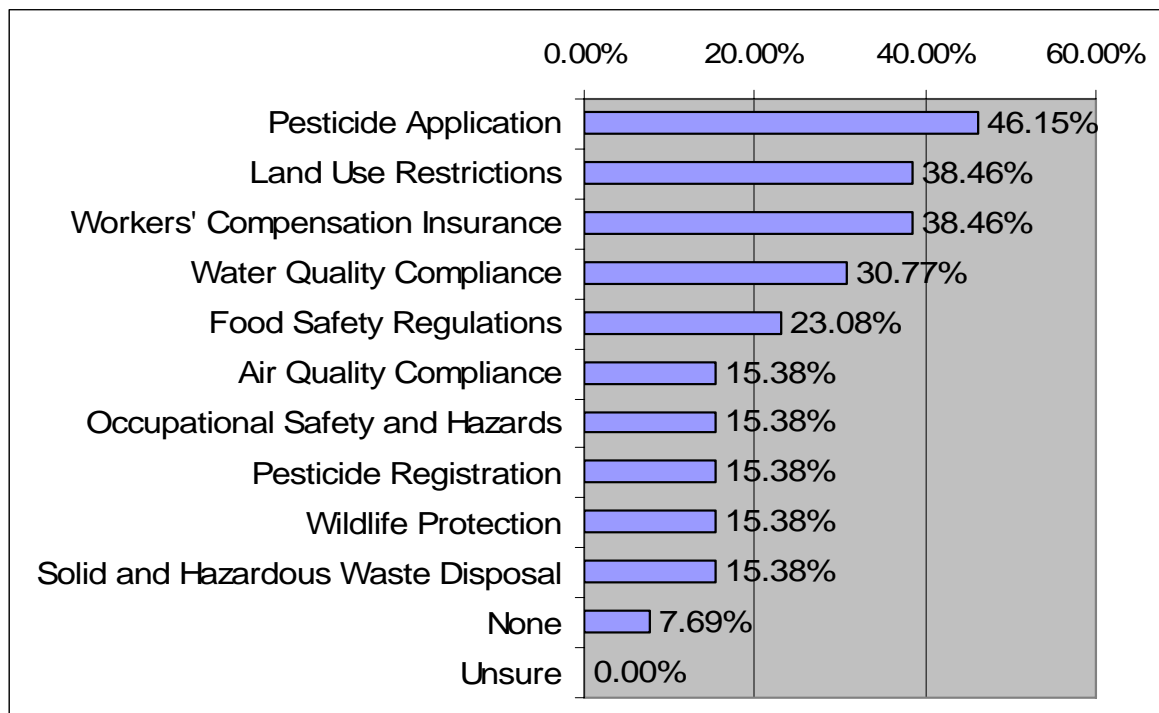


From Figure 3-23 above, it is clear that for most industries the regulatory environment in California is viewed at a minimum as Somewhat Complex by a vast majority of the producers. The question arises as to what areas of the regulatory environment are foremost on the thoughts of the producers. To tackle this question, an examination was done of the impacts that each regulatory area had on the producers as well as a look at the cost associated with each regulatory area. Specifically, the producers were asked to indicate whether each regulatory area had a positive, negative, or no impact on their financial, operational, and managerial aspects of production. The other question asked producers to identify the top three regulatory areas increasing their operating costs. Presented below is an in-depth look at which regulatory areas are having the greatest impact on the differing industries in this study.

## Regulatory Areas Affecting the Berry Industry

Figure 3-24 provides the percentage of producers in the berry industry who chose each regulatory area as a top three area affecting production costs. The top regulatory area affecting these producers is the pesticide application area. Over forty-six percent of the berry producers chose this area as one of the top three. Tied for second in percentages of producers are the land use restrictions and worker's compensation insurance areas. For both of these areas, over thirty-eight percent of producers chose these two to be one of the top three regulatory areas increasing production costs. Water quality compliance and food safety regulations garnered the fourth and fifth highest percentages. Air quality compliance, occupational safety and hazards, pesticide registration, wildlife protection, and solid and hazardous waste disposal all garnered the same percentage. None and unsure categories received the lowest percentages.

**Figure 3-24: Percentage of Berry Producers Who Believe Operating Costs Have Increased Due to Regulatory Area\***



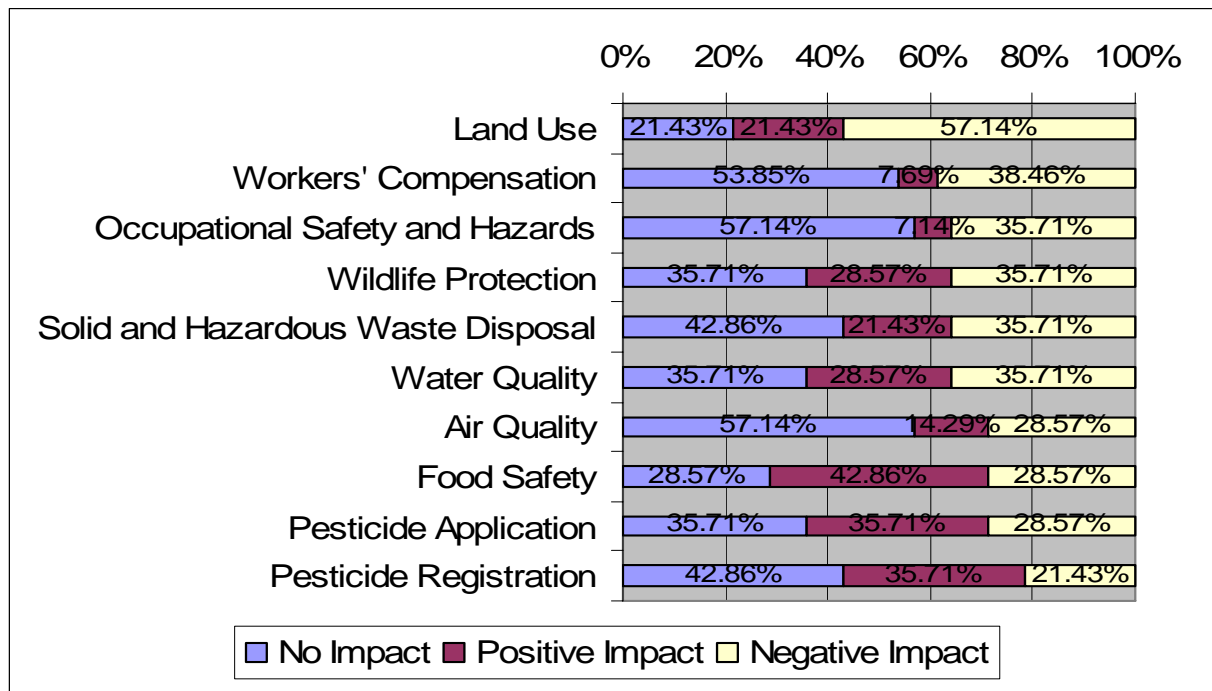
\*Producers had the opportunity to choose up to three of these areas.

While the previous figure examined the regulatory areas increasing the operational costs of berry producers, Figure 3-25 presents how producers view the impact of each of the regulatory area on their operation. The top two negative impacting areas were land use and worker's compensation. Over fifty-seven percent of the berry producers believe that land use regulations were having a negative impact on their operations. Thirty-eight percent of producers believe that worker's



compensation has a negative affect on their operations. The areas of occupational safety and hazards, wildlife protection, solid and hazardous waste disposal, and water quality all tied for third in the highest percentage of producers indicating a negative impact. Except for land use and food safety, all other regulatory areas had over a third of the producers indicating that the regulatory areas had no impact on their operations. Each regulatory area had a group of producers identify that the regulatory area has a positive impact on their operations. Food safety had the highest percentage of producers indicating a positive impact followed by pesticide application and pesticide registration.

**Figure 3-25: Impact of Different Regulatory Areas on the Berry Industry**

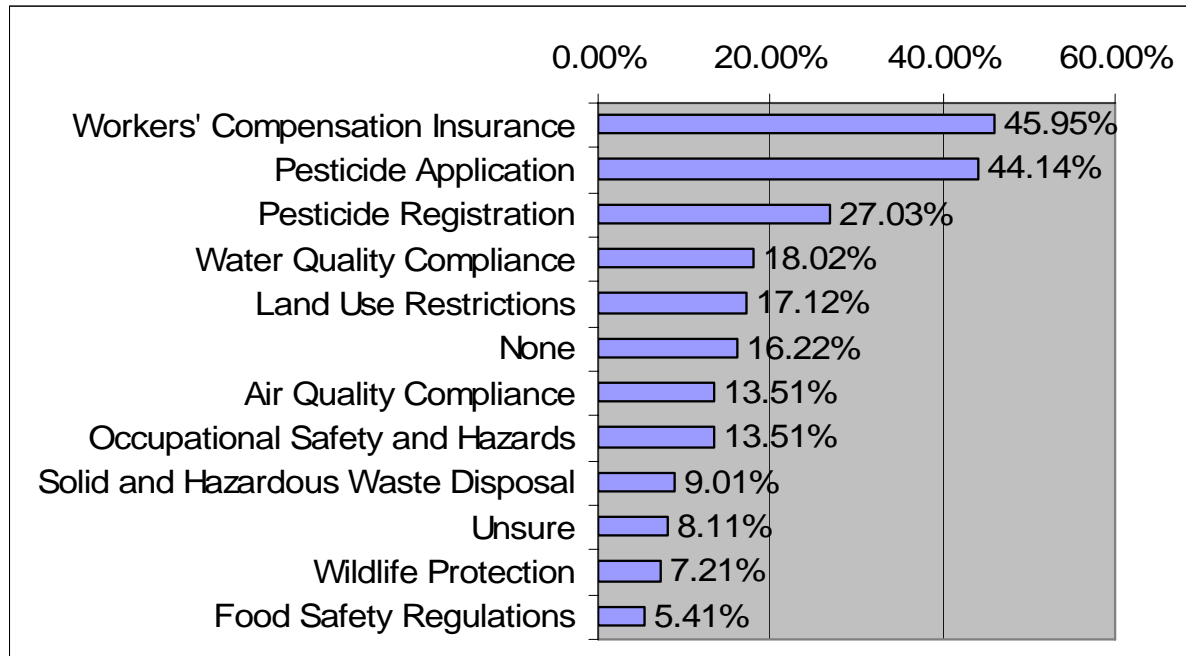


While the areas of land use and worker’s compensation are consistently in the top three regulatory areas for both negative impact and top three regulatory areas increasing the berry producers operating cost, the third area is not so clear. While there were three regulatory areas that tied for third in negative impact, none of the areas were pesticide application which was ranked first in the top three categorization. This would imply that while producers’ costs are increasing due to the pesticide application regulations, from a managerial and operational standpoint, other regulations are having a greater negative impact. Furthermore, many berry producers recognize that pesticide application regulations have positive impact on them.

### Regulatory Areas Affecting the Citrus Industry

The citrus industry has two clear-cut regulatory areas that producers believe are increasing their operational costs. Figure 3-26 shows that workers compensation at nearly forty-six percent and pesticide application at forty-four percent were identified most consistently by producers as a top three regulatory area increasing production costs. Pesticide registration ranks third at twenty-seven percent. Water quality compliance and land use restrictions ranked a distant fourth and fifth behind the top three. Interestingly, the response None was ranked sixth over the other areas which would indicate that many of the other regulatory areas are nowhere near as important as the top three.

**Figure 3-26: Percentage of Citrus Producers Who Believe Operating Costs Have Increased Due to Regulatory Area\***

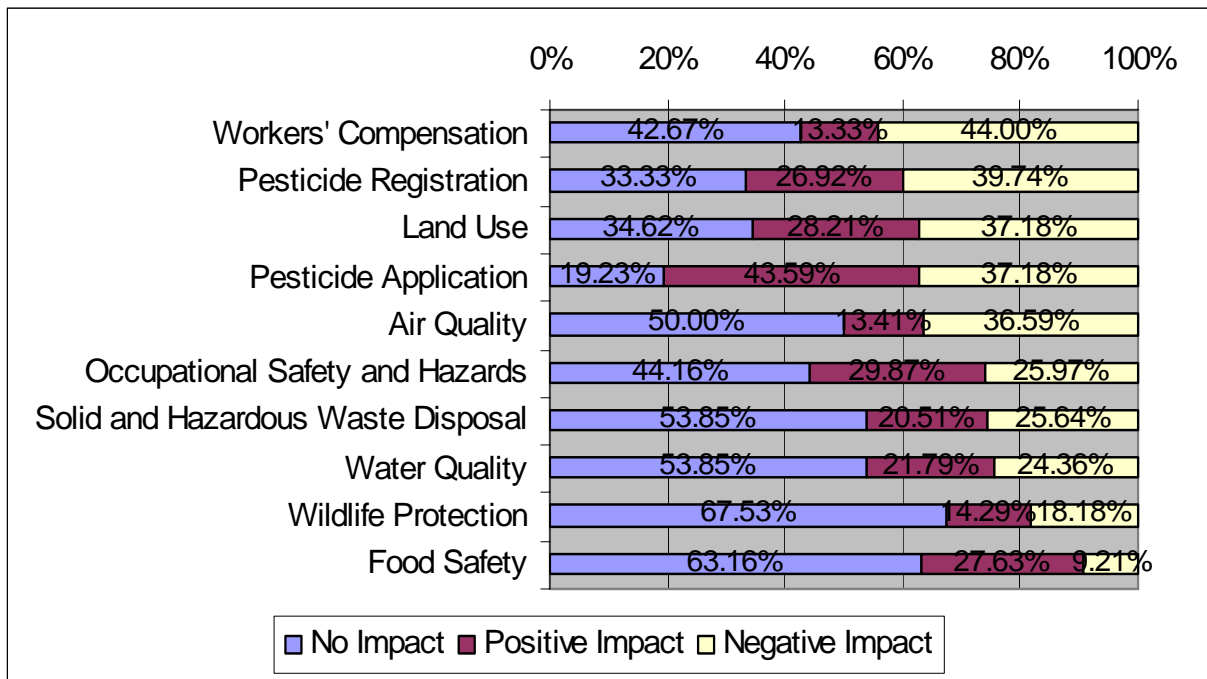


\*Producers had the opportunity to choose up to three of these areas.

Figure 3-27 presents how the producers viewed each regulatory area impacting their operations. The top two areas the producers believed that were having the largest negative impact were worker's compensation and pesticide registration. Forty-four percent of producers identified worker's compensation as having a negative impact, while nearly forty percent identified pesticide registration in the same manner. This is consistent with the results seen above where each of these areas were in the top three regulatory areas increasing producers cost. Pesticide

application was tied for third with land use in terms of negative impact. The areas of air quality, solid and hazardous waste disposal, water quality, wildlife protection, and food safety had at least fifty percent of the producers indicating that these areas had no impact on their operation. At approximately forty-four percent, pesticide application had the highest percentage of citrus producers identifying that this area had a positive effect on their operation. Worker's compensation and air quality had the lowest percentage of producers indicating a positive impact.

**Figure 3-27: Impact of Different Regulatory Areas on the Citrus Industry**

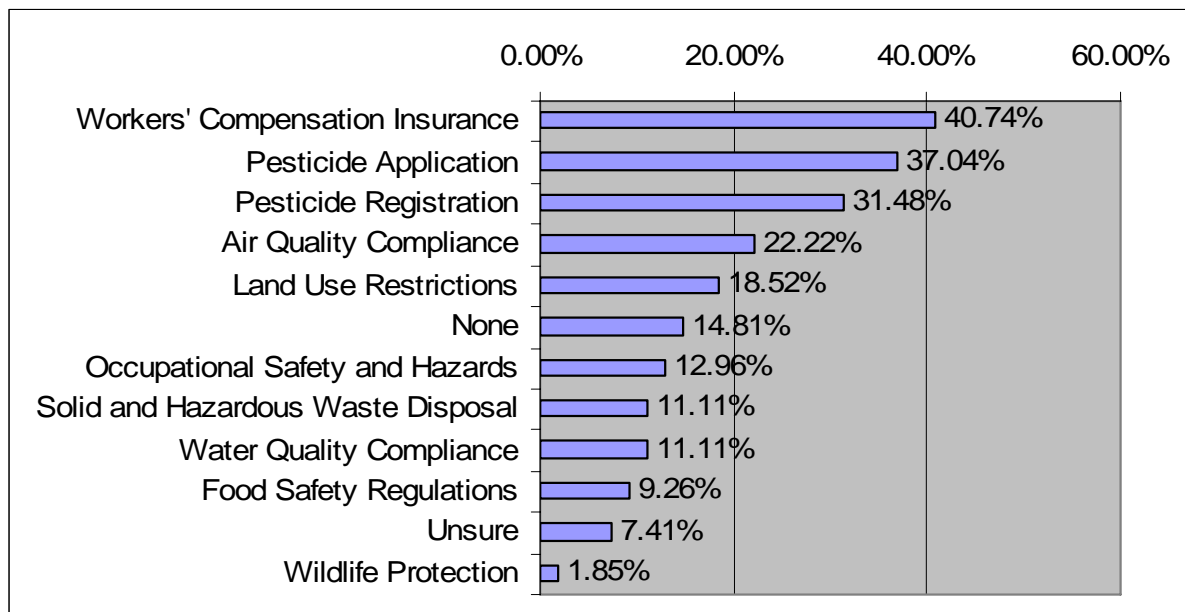


The two figures above show a fairly consistent picture regarding the regulatory areas. Citrus producers identify workers compensation as having the greatest negative impact and cost on citrus producers operations in both cases. Pesticide registration and pesticide application were in the top three for both areas, but their order switched between the two questions posed to the producers. Land use is consistently ranked in the top five. This would imply that the regulatory areas that are increasing the producers cost is also dominating the citrus producers view of how each regulatory area is impacting their operation.

### Regulatory Areas Affecting the Deciduous Fruit Industry

The deciduous fruit industry’s top three regulatory areas mirror the citrus industry. Workers’ compensation, pesticide application, and pesticide registration had the three highest percentages of producers indicating that these areas increased their production cost. Figure 3-28 shows that workers compensation had nearly forty-one percent of the producers indicating it as one of the top three. The areas of pesticide application and pesticide registration each received thirty-seven and thirty-one percent respectively. Air quality compliance and land use regulations received the fourth and fifth highest percentages. The area of none received the sixth highest percentage which would imply that the other regulatory areas are not that significant of issues for producers as a whole.

**Figure 3-28: Percentage of Deciduous Fruit Producers Who Believe Operating Costs Have Increased Due to Regulatory Area\***

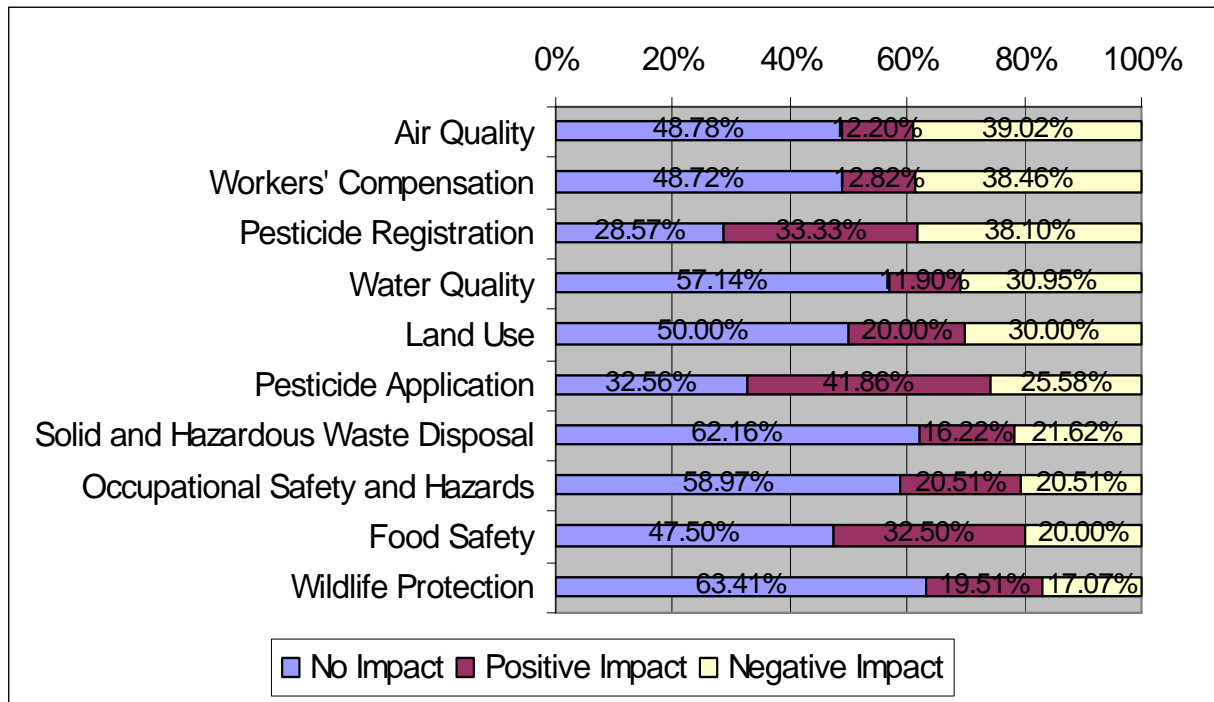


\*Producers had the opportunity to choose up to three of these areas.

Examining Figure 3-29 shows that air quality was ranked the highest in terms of negatively impacting the deciduous fruit producers’ operation. Thirty-nine percent of producers indicated that air quality regulations had a negative impact on their operations. At thirty-eight percent, workers’ compensation was ranked second in terms of affecting the producer negatively. Also at thirty-eight percent was the area of pesticide registration. These three areas are all relatively close to each other. Water quality and land use round out the top five negatively impacting

regulatory areas. Wildlife protection and solid and hazardous waste disposal had the highest percentage of producers indicating no impact. Nearly forty-two percent of producers indicated that pesticide application regulations had a positive impact on their operation. Pesticide registration had a third of the producers indicating no impact.

**Figure 3-29: Impact of Different Regulatory Areas on the Deciduous Fruit Industry**



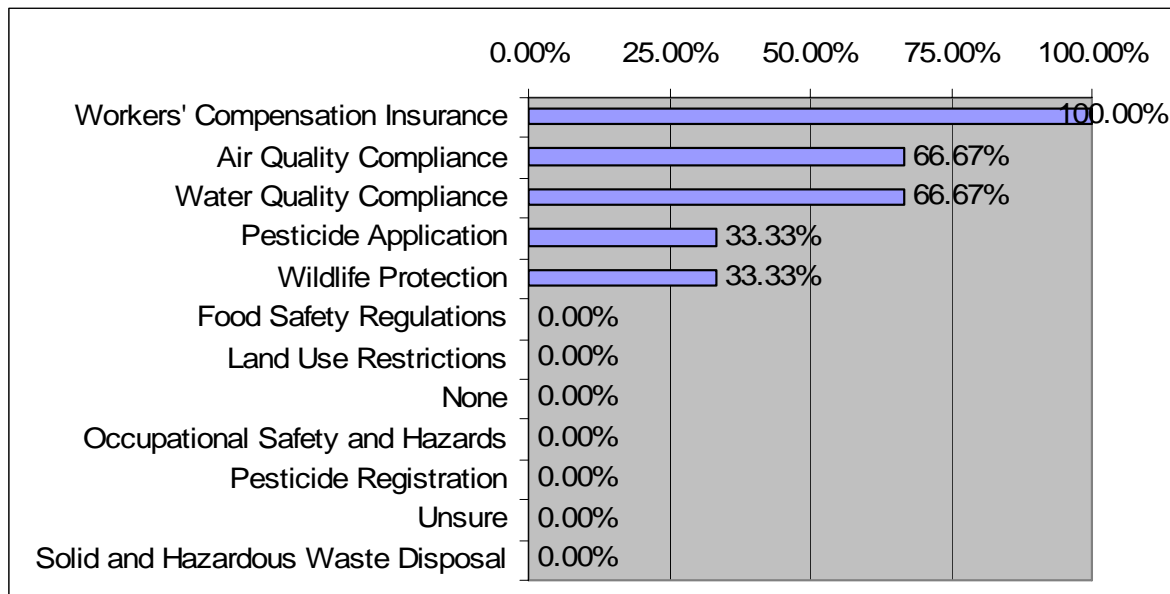
While air quality regulations had the highest percentage of producers indicating a negative impact, the producers only ranked this area fourth in terms of increasing their operating costs. Workers compensation was in the top two for both operating costs and negative impact. Pesticide registration remained a consistent third in both areas of ranking. Wildlife protection and food safety regulations were consistently at the bottom of the regulatory areas impacting the producers. Land use restriction was ranked fifth in both areas. It is clear that workers' compensation and pesticide registration are two of the top three issues for the deciduous fruit industry, whereas it is less clear which regulatory area would complete the top three. By the virtue of air quality being ranked fourth in increasing operating cost and first in negative impact, air quality regulations should be considered a top three regulatory area for the deciduous fruit industry.

### Regulatory Areas Affecting the Melon Industry

As was mentioned above the melon industry was only represented by four producers in the survey. Out of this four, only three answered questions regarding the top three issues and the level of impact of each of the regulatory areas. Hence, caution should be taken as to whether the results in this section are indicative of the whole industry. The reason to not put these producers into another industry like the berry industry is because these melon producers definitely have a distinct view of the regulatory environment that should be examined.

With that caveat, Figure 3-30 provides the results from the question asking producers to identify the top three regulatory issues affecting their operating costs. This figure shows that one hundred percent of these producers identified workers' compensation as one of the top three regulatory areas increasing their operating cost. Air quality and water quality compliance tied for second with two-thirds of the producers indicating these areas as top three issues. Pesticide application and wildlife protection each had a third of the producers. The rest of the regulatory areas received no responses.

**Figure 3-30: Percentage of Melon Producers Who Believe Operating Costs Have Increased Due to Regulatory Area\***

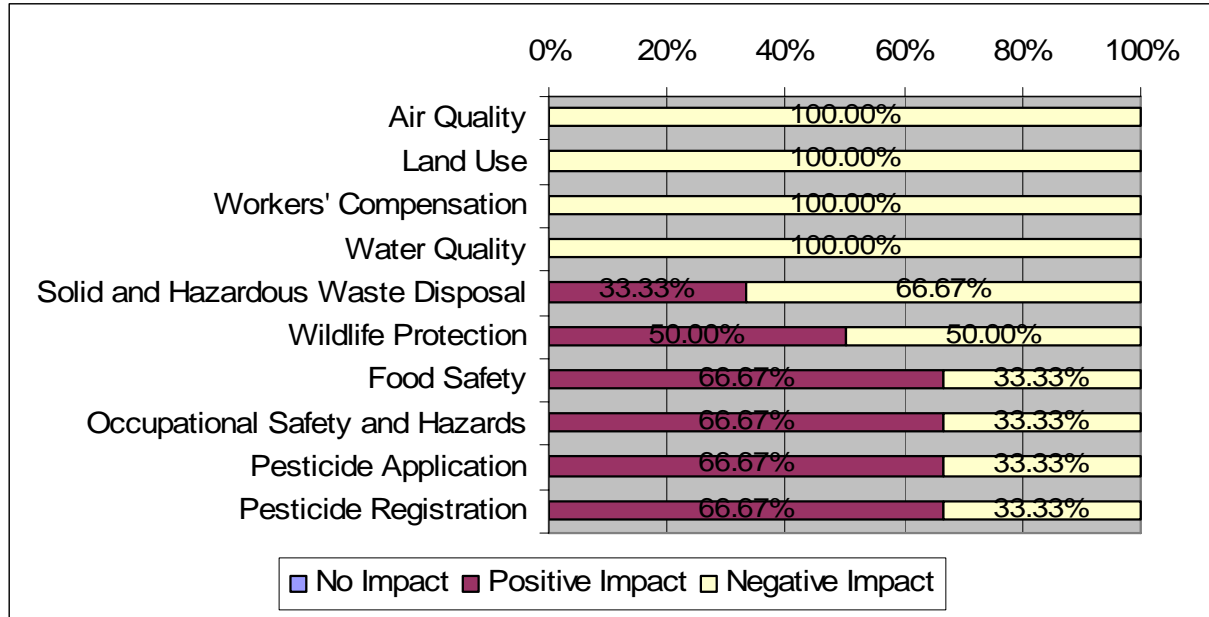


\*Producers had the opportunity to choose up to three of these areas.

Figure 3-31 shows how each regulatory area is impacting the melon producers in the survey. The melon producers in this study consistently indicated that all the regulatory areas either had a

positive impact or a negative impact. No producer chose the no impact category. Air quality, land use, workers' compensation, and water quality regulations were all viewed as having negative impacts on the melon producers in this study. Pesticide registration, pesticide application, occupational safety and hazards, and food safety had two-thirds of the producers indicating a positive impact.

**Figure 3-31: Impact of Different Regulatory Areas on the Melon Industry**



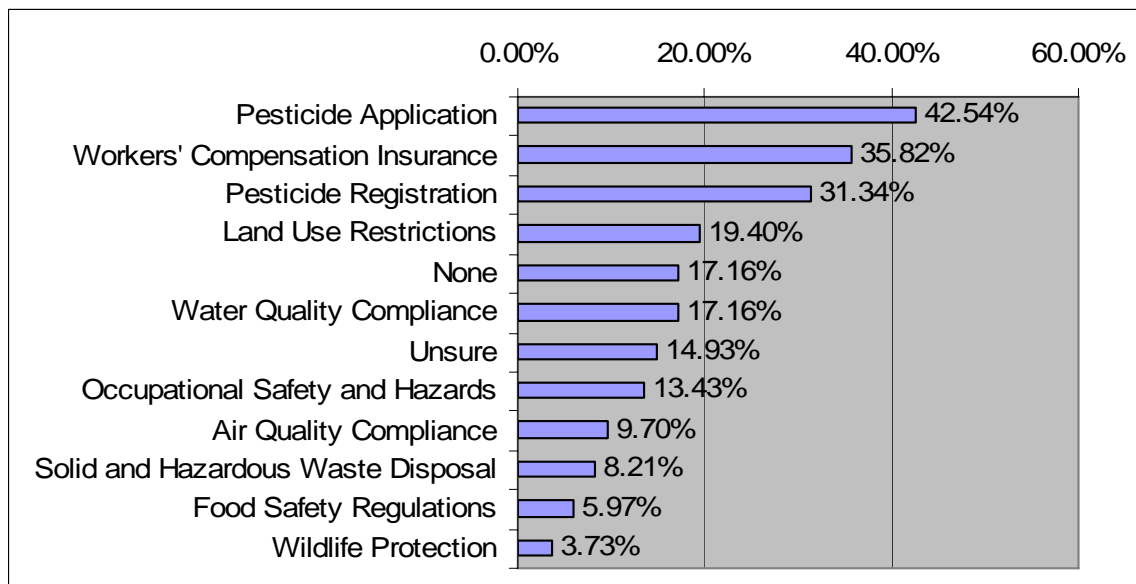
With so few producers it is difficult to identify the top three regulatory areas affecting the melon industry. The areas of workers' compensation, air quality, and water quality are on the forefront of the minds of the melon producers in this survey. It is safe to say that the melon producers in this survey are not having much difficulty with pesticide registration. These producers believe that each regulatory area is having some effect on their operations whether positive or negative because none chose the no impact choice for any of the regulatory areas.

### Regulatory Areas Affecting the Miscellaneous Fruit Industry

The miscellaneous fruit industry category encompassed many different fruits that could not be categorized well in the other areas. This industry encompassed guava producers, kumquat producers, dates producers, kiwifruit producers, olives, avocados, and fruits that are classified by CASS as noncitrus fruits. While all of these producers were considered a part of this industry, it was primarily made up of avocado and olive producers.

Similar to many of the other fruit industries, Figure 3-32 shows that pesticide application, workers' compensation, and pesticide registration were considered by producers to be the top three regulatory areas increasing their costs. Pesticide application had nearly forty-three percent of the producers indicating that it was a top three area. Worker's compensation received approximately thirty-six percent of producers indicating it was top three, while pesticide registration had thirty-one percent. Land use ranks as the number four regulatory area, while None garnered the fifth ranking. Five of the regulatory areas were below the None area and the Unsure area. These were occupational safety and hazards, air quality compliance, solid and hazardous waste disposal, food safety regulations, and wildlife protection.

**Figure 3-32: Percentage of Miscellaneous Fruit Producers Who Believe Operating Costs Have Increased Due to Regulatory Area\***

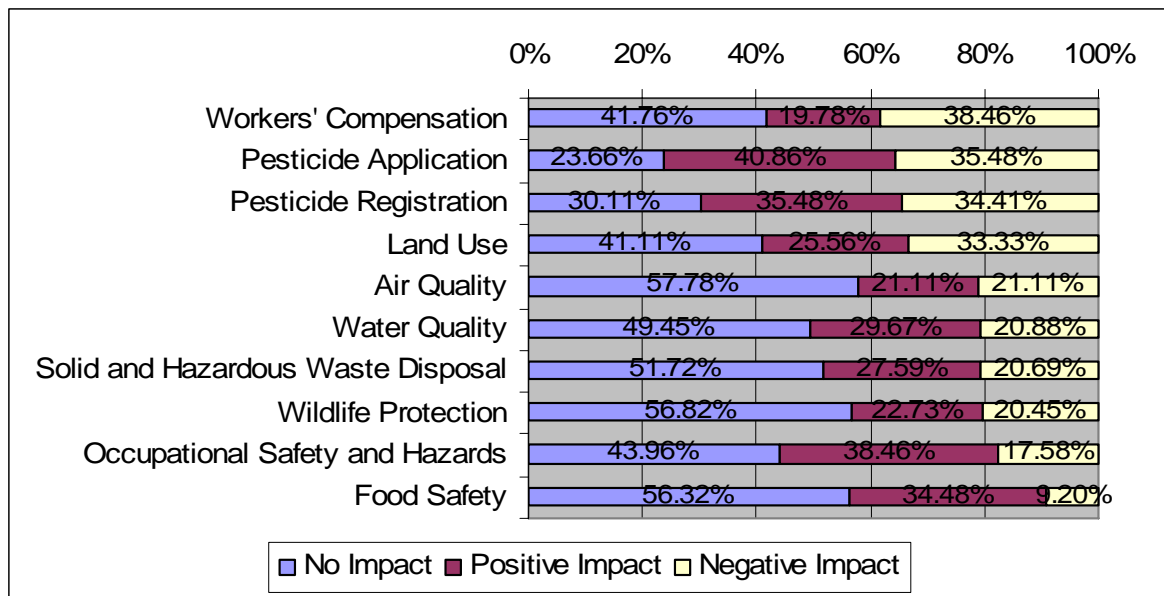


\*Producers had the opportunity to choose up to three of these areas.



Figure 3-33 shows how producers viewed each regulatory area impacting their operations. Workers' compensation at thirty-eight percent was ranked first by producers in terms of negatively impacting the producers operation. Pesticide application, pesticide registration, and land use regulations were ranked second, third, and fourth respectively with these three areas very close to each other. Air quality, wildlife protection, and food safety regulations had the largest percentage of producers indicating that these areas had no impact on their operation. Pesticide application and occupational safety and hazards regulations had the greatest percentage of producers indicating a positive impact to their operations.

**Figure 3-33: Impact of Different Regulatory Areas on the Miscellaneous Fruit Industry**

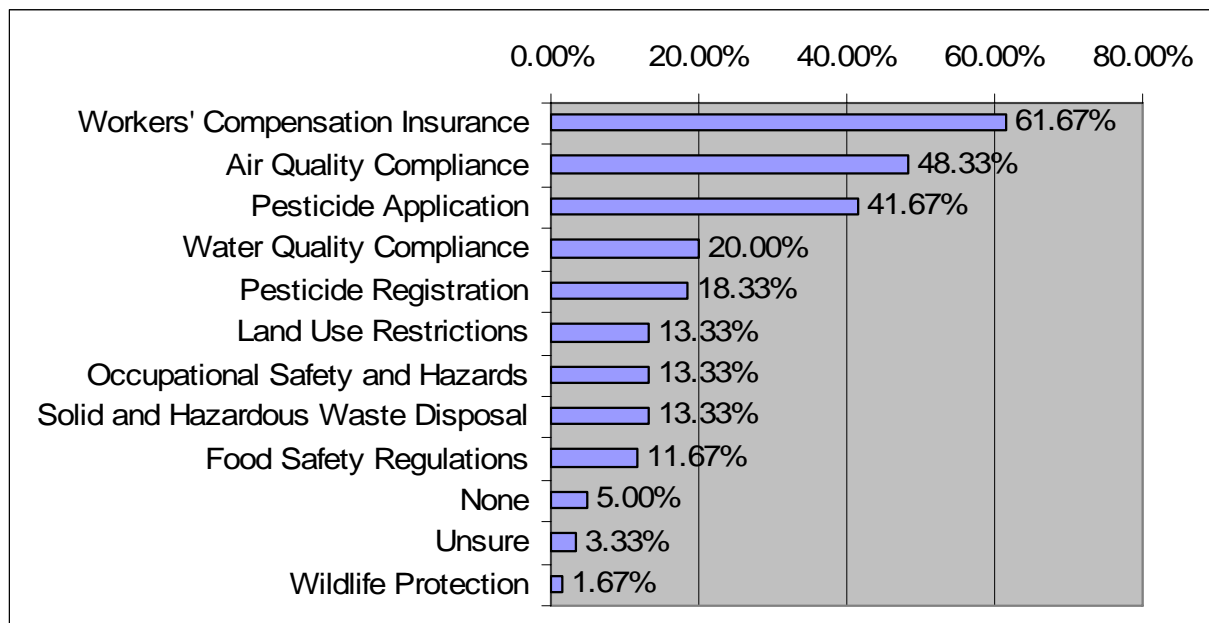


Worker's compensation, pesticide application, and pesticide registration are clearly the top three regulatory areas affecting the miscellaneous fruit industry. While pesticide registration was ranked third under both questions of the survey, workers' compensation and pesticide application changed position between the two questions asked. Land use is consistently the fourth ranked issue for these set of producers. Food safety and wildlife protection were consistently on the bottom of producers list of regulatory areas affecting them.

### Regulatory Areas Affecting the Stone Fruit Industry

The stone fruit producers definitely had three regulatory areas that rose to the top three issues. Figure 3-34 shows that workers' compensation, air quality regulations, and pesticide application are the top three regulatory areas affecting producers operating cost. Nearly sixty-two percent of stone fruit producers chose workers compensation as their top three issues. This is over three times the amount of the fourth ranked regulatory area of water quality compliance. Air quality compliance had forty-eight percent of producers choosing it as a top three issue, while pesticide application drew forty-one percent of the stone fruit producers. Pesticide registration ranked as the fifth highest issue. Similar to many of the other industries already examined, food safety and wildlife protection were ranked near the bottom.

**Figure 3-34: Percentage of Stone Fruit Producers Who Believe Operating Costs Have Increased Due to Regulatory Area\***

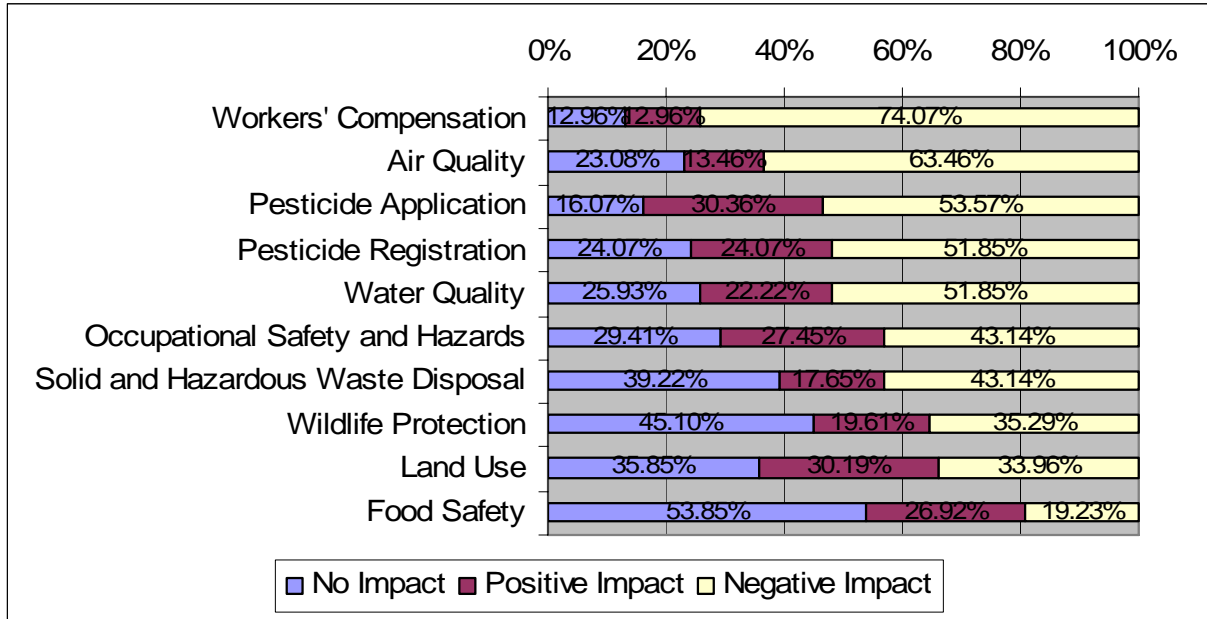


\*Producers had the opportunity to choose up to three of these areas.

Figure 3-35 shows that the top five regulatory areas affecting the stone fruit producers' financial, operational, and managerial aspects of their farms, received over fifty-percent of the producers choosing negative impact. Worker's compensation ranked first with seventy-four percent of producers indicating their operations were negatively impacted by the regulatory area. Over sixty-three percent of producers indicated that air quality regulations were having a negative impact to their production. This would place the regulatory area of air quality as the second

highest issue. The third highest ranking issue for stone fruit producers was pesticide application regulations. Approximately fifty-four percent of the producers believed that these regulations were having a negative impact. The regulatory areas of food safety and wildlife protection had the highest percentage of producers indicating no impact. Land use and pesticide application had the highest percentage of producers selecting a positive impact due to the regulatory area.

**Figure 3-35: Impact of Different Regulatory Areas on the Stone Fruit Industry**

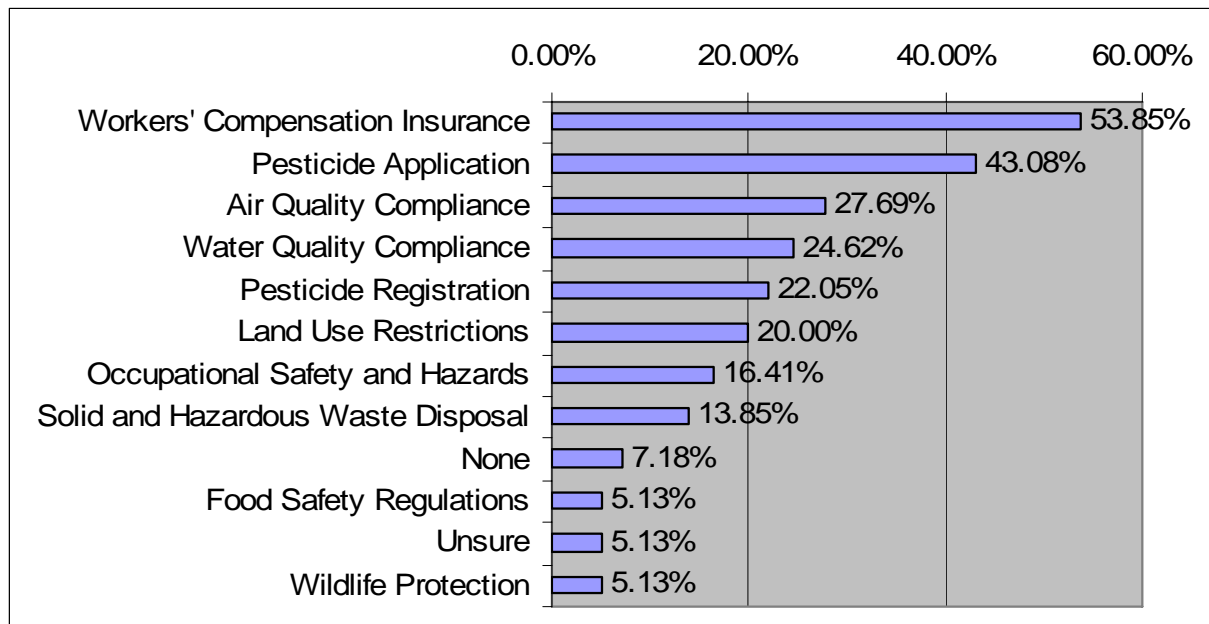


From the two above figures it is clear which regulatory areas are top three for the stone fruit producers. Workers' compensation, air quality, and pesticide application were ranked first through third respectively under both regulatory questions posed to the producers. Workers compensation had nearly three-quarters of the producers indicating a negative impact. Only thirteen percent indicated that it had a positive impact on their operation. Pesticide registration and water quality regulatory areas switched positions for the fourth and fifth ranking between questions. Comparing the stone fruit producers to many of the industries already examined shows that stone fruit produces have a more negative view of each of the regulatory areas over the other producers.

### Regulatory Areas Affecting the Grape Industry

The regulatory area of workers compensation tops the list of the area increasing operating cost. As can be seen in Figure 3-36, nearly fifty-four percent of grape producers chose workers compensation as a top three regulatory area increasing their operating costs. Pesticide application was ranked second with forty-three percent of the producers choosing it. At approximately twenty-eight percent, air quality compliance ranked third out of the regulatory areas. The fourth ranked area for this question was water quality compliance, while the fifth ranked area was pesticide registration. Food safety regulations and wildlife protection were near the bottom of the list for these producers.

**Figure 3-36: Percentage of Grape Producers Who Believe Operating Costs Have Increased Due to Regulatory Area\***

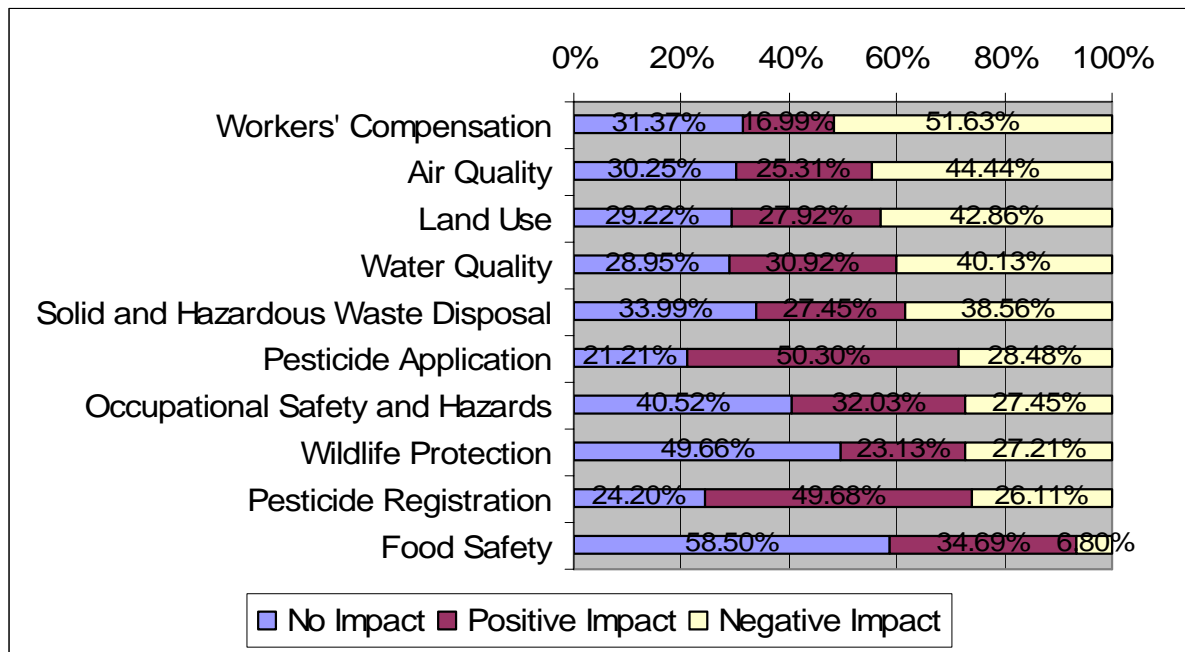


\*Producers had the opportunity to choose up to three of these areas.

Examining the impacts of the differing regulatory areas provides a different view of what producers find as their top regulatory issues. Figure 3-37 shows that workers' compensation is still the highest ranked area with approximately fifty-two percent of producers indicating that this area had a negative impact on their operations. Air quality regulations rank second with over forty-four percent of producers indicating a negative impact. Land use, which was not a top five area in the previous question, ranks third in negative impact. Almost forty-three percent of producers indicated that the regulatory area of land use has a negative impact on their operations.

Water quality ranks fourth in negative impact, while solid and hazardous waste disposal ranks fifth. Food safety and wildlife protection had the highest percentage of producers indicating no impact. Pesticide registration and pesticide application received the highest percentage of producers believing these areas had a positive impact on their operations.

**Figure 3-37: Impact of Different Regulatory Areas on the Grape Industry**

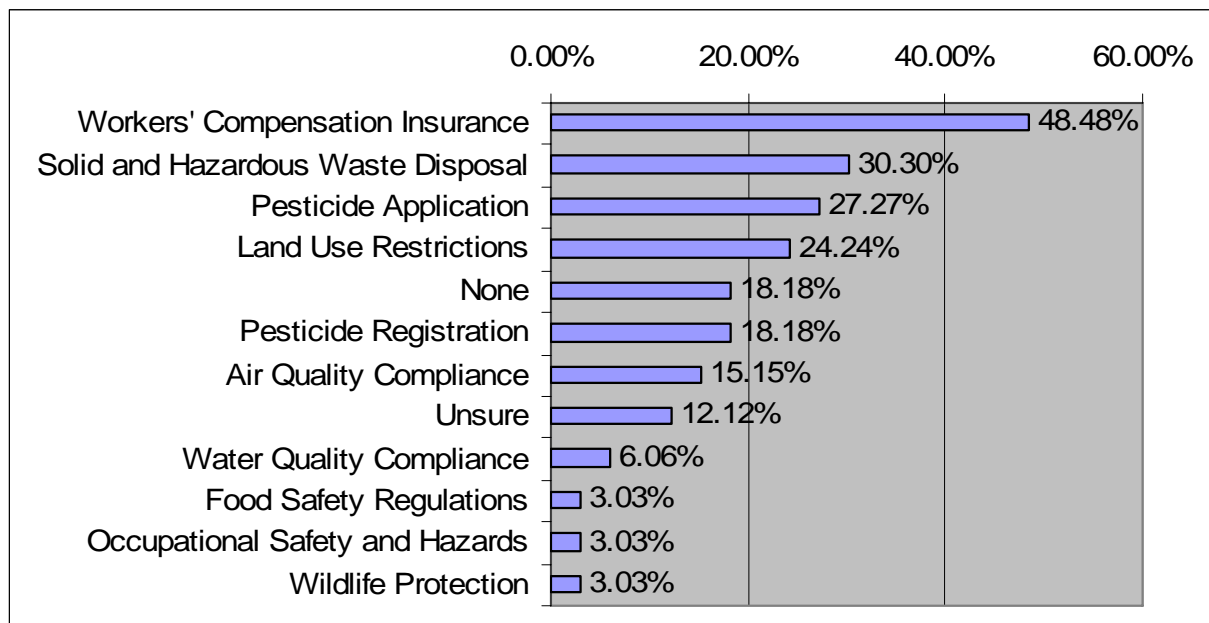


For the grape industry, workers compensation and air quality are top three regulatory areas affecting their operations. The third regulatory area is less clear. While pesticide application appears to be a regulatory area having a large effect on increasing producers operating cost, a majority of grape producers see this regulatory area as having a positive impact on their operations. Water quality is consistently the fourth ranked issue. Solid and hazardous waste disposal regulations do not appear to be a large regulatory issue for the grape producers in terms of operating cost, but it moves up a couple positions in the rankings when examining its overall impact on the producers operation.

### Regulatory Areas Affecting the Horticulture Industry

Like many of the other industries already investigated, the horticultural industry’s top regulatory area is workers compensation. Over forty-eight percent of horticultural producers indicated workers’ compensation was a top three regulatory area increasing operating costs (See Figure 3-38). At thirty-percent, solid and hazardous waste disposal ranked second for horticultural producers as a top three area. The third ranked area was pesticide application with twenty-seven percent of the producers indicating that it was a top three area increasing their cost. Land use restrictions ranked fourth, while the response of None tied for fifth with pesticide registration. Wildlife protection, occupational safety and hazards, and food safety regulations were at the bottom of the ranking with only three percent of the producers indicating that each were a top three issue.

**Figure 3-38: Percentage of Horticulture Producers Who Believe Operating Costs Have Increased Due to Regulatory Area\***

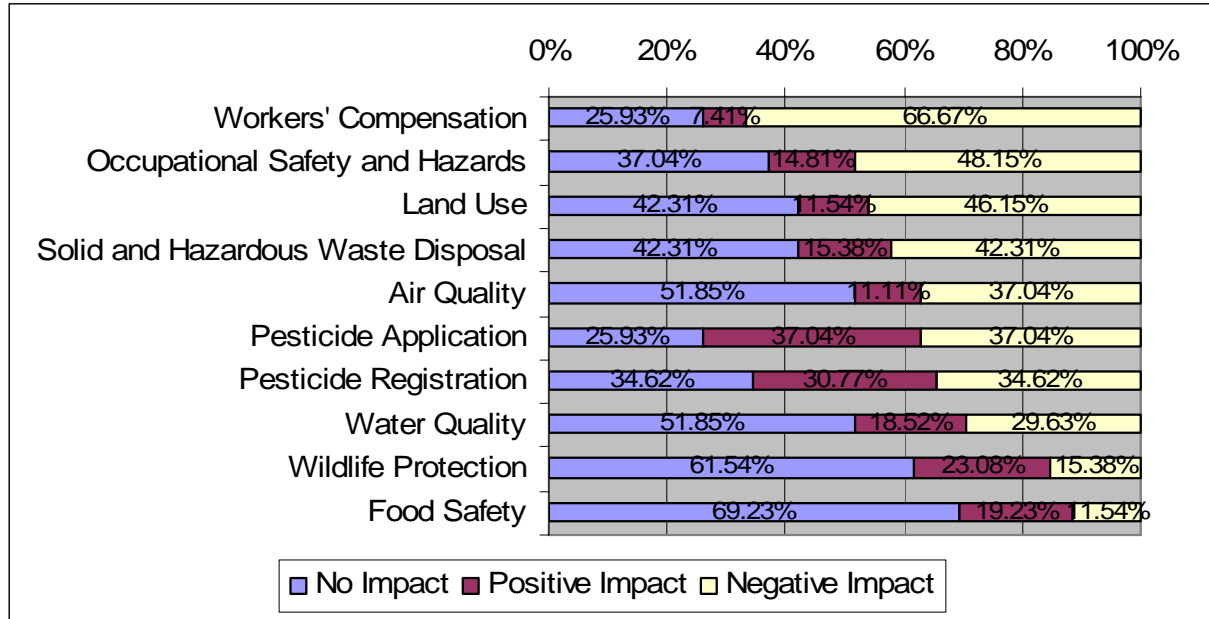


\*Producers had the opportunity to choose up to three of these areas.

Figure 3-39 shows how producers viewed the impacts of each of the regulatory areas. At nearly sixty-seven percent, workers’ compensation is the highest ranking regulatory area having a negative impact on producers. Occupational safety and hazards and land use were ranked second and third respectively. Forty-eight percent of horticultural producers believe that occupational safety and hazards regulations are having a negative impact, while forty-six percent indicated land use. Solid and hazardous waste disposal, which was ranked second in the above question,

ranked fourth in negative impacts to the operation. The regulatory area of air quality was ranked fifth. Wildlife protection and food safety had the highest percent of producers indicating that the regulatory area had no impact on their operations. Pesticide application and pesticide registration were viewed by these producers as having the largest positive impact to their operations.

**Figure 3-39: Impact of Different Regulatory Areas on the Horticulture Industry**

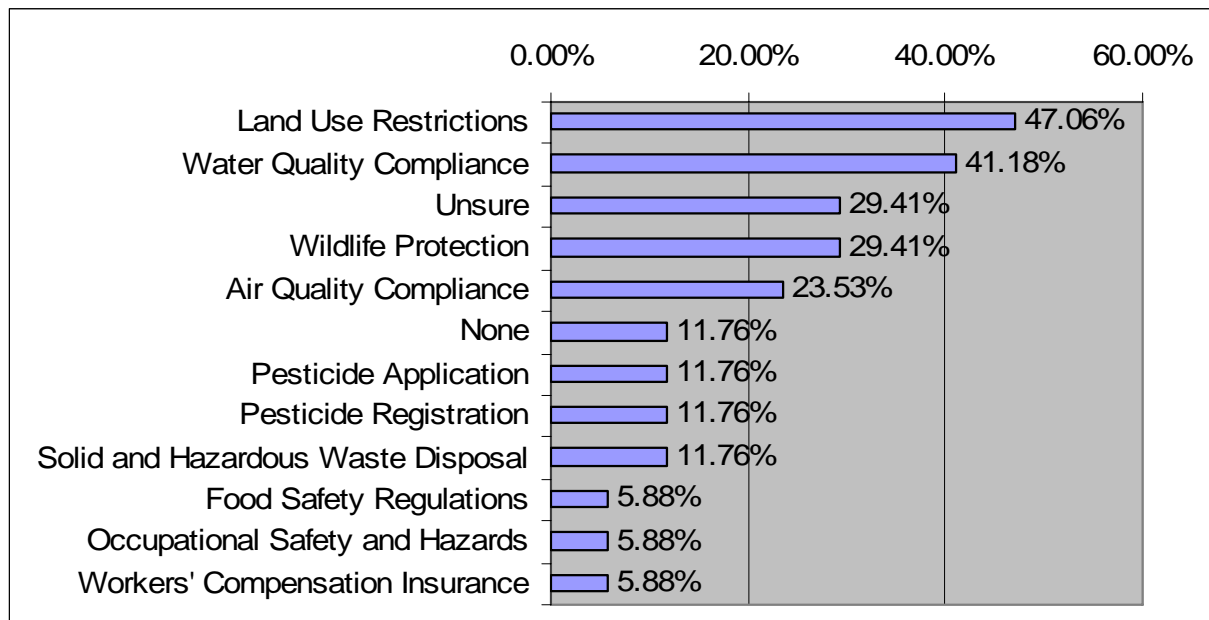


The only regulatory area that matched up as a top three issue between both questions posed to the horticultural producers was workers' compensation. Examining both figures above shows that the second and third ranking regulatory areas are unclear. While solid and hazardous waste disposal and pesticide application are two of the three areas increasing production cost the most, occupational safety and hazards and land use are viewed as having the highest percentage of producers indicating a negative impact. This would imply that when you examine the cost increasing regulatory areas, they are very different from the regulatory areas having a negative impact on the producers' operations.

### Regulatory Areas Affecting the Timber Industry

When asked which regulatory areas are the top three increasing the producers cost, forty-seven percent of timber producers indicated land use restrictions. This ranks land use restrictions as the number one regulatory issue increasing timber producers operating cost. Figure 3-40 shows that water quality compliance ranked second with forty-one percent of the producers indicating it in the top three. Curiously, wildlife protection and unsure tied for the third ranking regulatory area. Air quality compliance ranked fifth. There was an expectation that worker's compensation would be top of the list since the timber industry has one of the highest rates in California, but examining the results show it at the bottom. To explain this issue, further examination was done to see what type of timber producers were represented in the study. Most of the timber producers in the survey would be classified as small operators. This would imply that these producers are probably not seeing much in the way of workers compensation costs because they are cuttings trees on a rare occasion or their volume per cutting is so low that the costs are not a major aspect of production. It should also be noted that many of these timber producers had other operations which appear to account for a major portion of their income.

**Figure 3-40: Percentage of Timber Producers Who Believe Operating Costs Have Increased Due to Regulatory Area\***

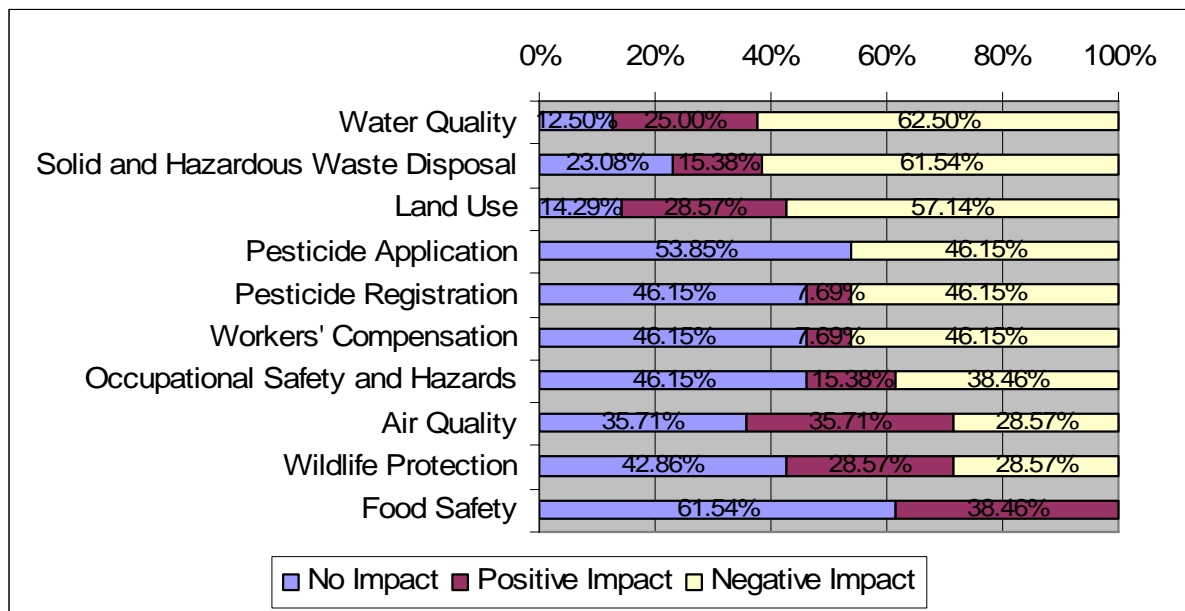


\*Producers had the opportunity to choose up to three of these areas.



Figure 3-41 shows that water quality regulations had the highest percentage of producers indicating a negative impact. Over sixty-two percent of timber producers in the survey indicated that water quality regulations had a negative impact on their operations. At nearly sixty-two percent, solid and hazardous waste disposal had the second highest percentage of producers indicating a negative impact. Land use was ranked third in negatively impacting regulatory areas. As expected, food safety had the highest percentage of producers indicating no impact. It also had the highest percentage of producers indicating a positive impact. While it may seem strange for a timber producer to indicate a positive impact for this area, it makes sense if you consider that many of these timber producers are cattle producers.

**Figure 3-41: Impact of Different Regulatory Areas on the Timber Industry**

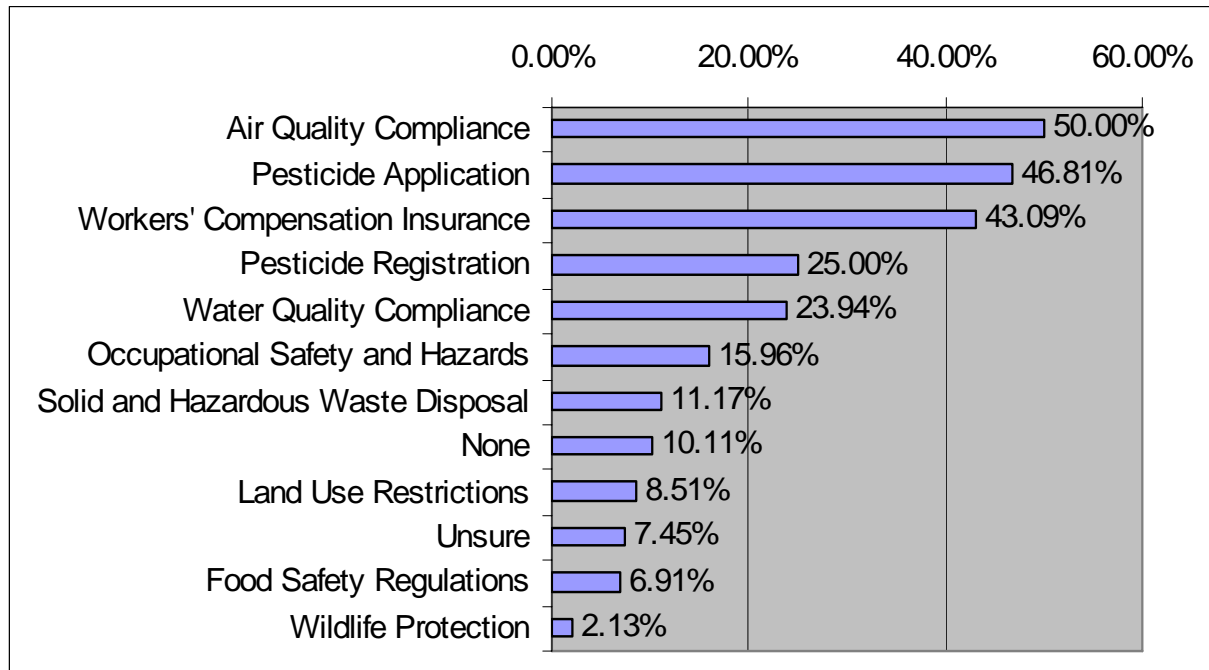


Given the respondents that were in the producers' survey, it is difficult to say whether these results are indicative for the timber industry. From the standpoint of producers in general, these results may be indicative of how timber producers view the regulatory environment because there could be a large percentage of timber producers who are small. But, these producers are probably not representative of the industry in terms of the volume produced. It does not appear that the survey is indicative of the large producers. This being the case, no judgment will be made as to what the top regulations are for this industry.

### Regulatory Areas Affecting the Tree Nut Industry

The top three ranked regulatory areas that tree nut producers believe are increasing their operation costs are air quality compliance regulations, pesticide application, and workers' compensation. Figure 3-42 shows that fifty percent of tree nut producers indicated that air quality compliance is a top three issue. Nearly forty-seven percent of producers chose pesticide application as a top three issue, while workers' compensation had forty-three percent. A distant fourth and fifth were pesticide registration and water quality compliance. Similar to many other industries already examined, food safety regulations and wildlife protection were at the bottom of the rankings.

**Figure 3-42: Percentage of Tree Nut Producers Who Believe Operating Costs Have Increased Due to Regulatory Area\***

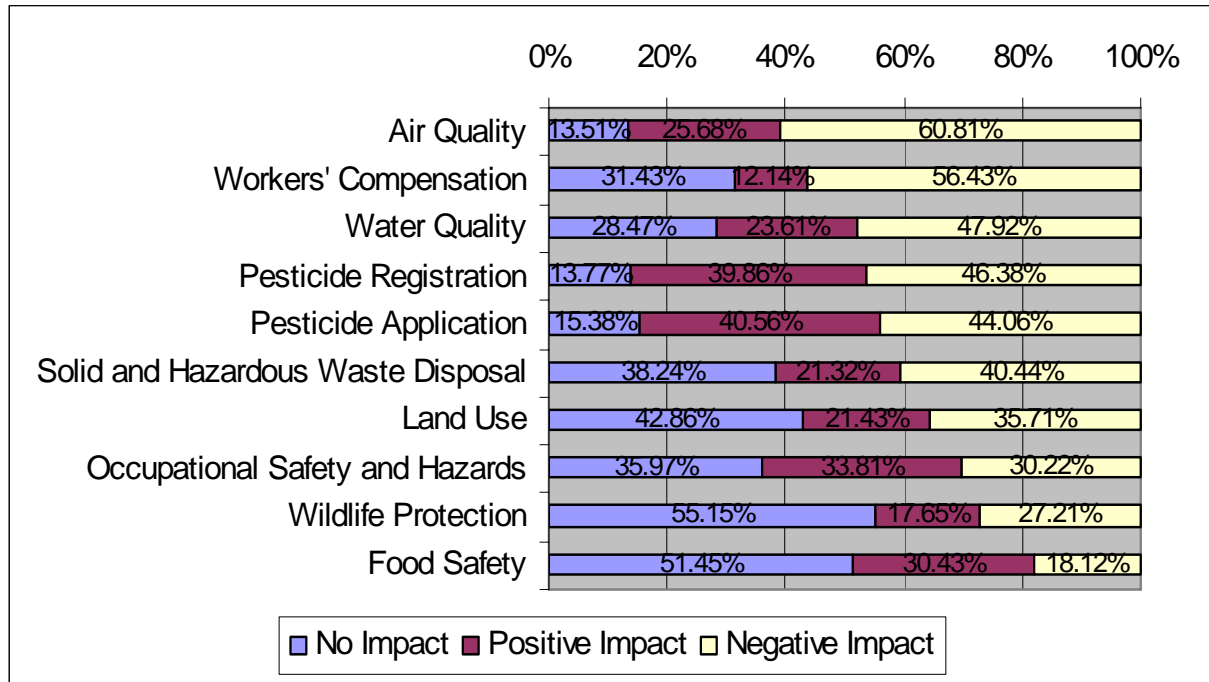


\*Producers had the opportunity to choose up to three of these areas.

Two regulatory areas received over fifty percent of producers indicating a negative impact (See Figure 3-43). These were air quality regulations and workers' compensation at sixty-one percent and fifty-six percent respectively. Water quality was ranked third by the producers in negatively impacting regulatory areas. Pesticide application and solid and hazardous waste disposal were ranked fourth and fifth respectively. Wildlife protection and food safety had the highest percentage of producers indicating no impact to their operations. Pesticide application and

pesticide registration were identified by the producers as the areas providing the highest level of impact. Workers' compensation and wildlife protection are viewed by producers as having the smallest positive effect on their operations.

**Figure 3-43: Impact of Different Regulatory Areas on the Tree Nut Industry**

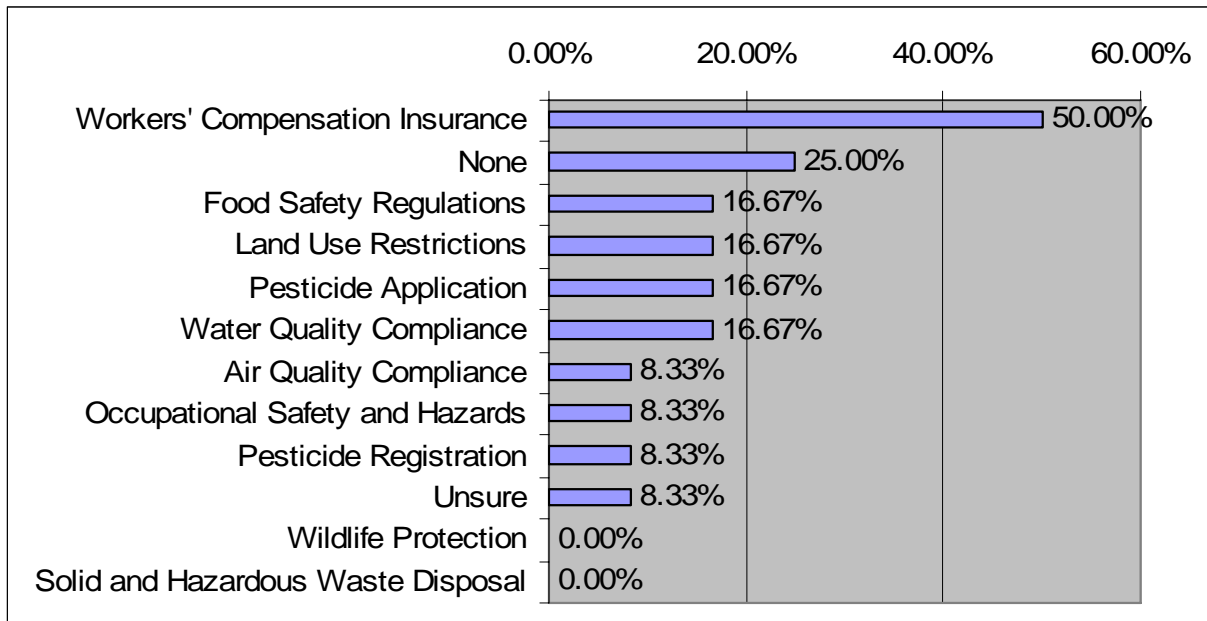


The tree nut producers consistently ranked air quality regulations as the top areas affecting their overall operations and the operating cost. Workers' compensation switches between second and third for each of the questions asked in the survey. Water quality which was ranked fifth in production costs jumped to the third ranking when examined for its overall effect. Pesticide application appears to have a large effect related to increasing operating costs, but drops to fifth when examined in terms of an overall effect on the operations. It appears that tree nut producers are mixed on whether pesticide application regulations and pesticide registrations have a positive or negative impact to the producers overall operation.

### Regulatory Areas Affecting the Leafy Vegetable Industry

Figure 3-44 shows that fifty percent of the producers in the leafy vegetable industry chose workers' compensation as one of the three top regulatory areas increasing their operating cost. Unexpectedly, the second highest rank category is none with twenty-five percent of producers indicating this response. Food safety, land use restrictions, pesticide application, and water quality compliance all tied for third. The areas of wildlife protection and solid and hazardous waste disposal ranked at the bottom of the list with no producers choosing either area as a top three area. With the area of None garnering the second position in the ranking, it can be inferred that, except for workers' compensation, regulations do not have a great effect on increasing these producers operating cost. With only twelve producers responding to this question, it is difficult to say if these results are representative of the industry.

**Figure 3-44: Percentage of Leafy Vegetable Producers Who Believe Operating Costs Have Increased Due to Regulatory Area\***

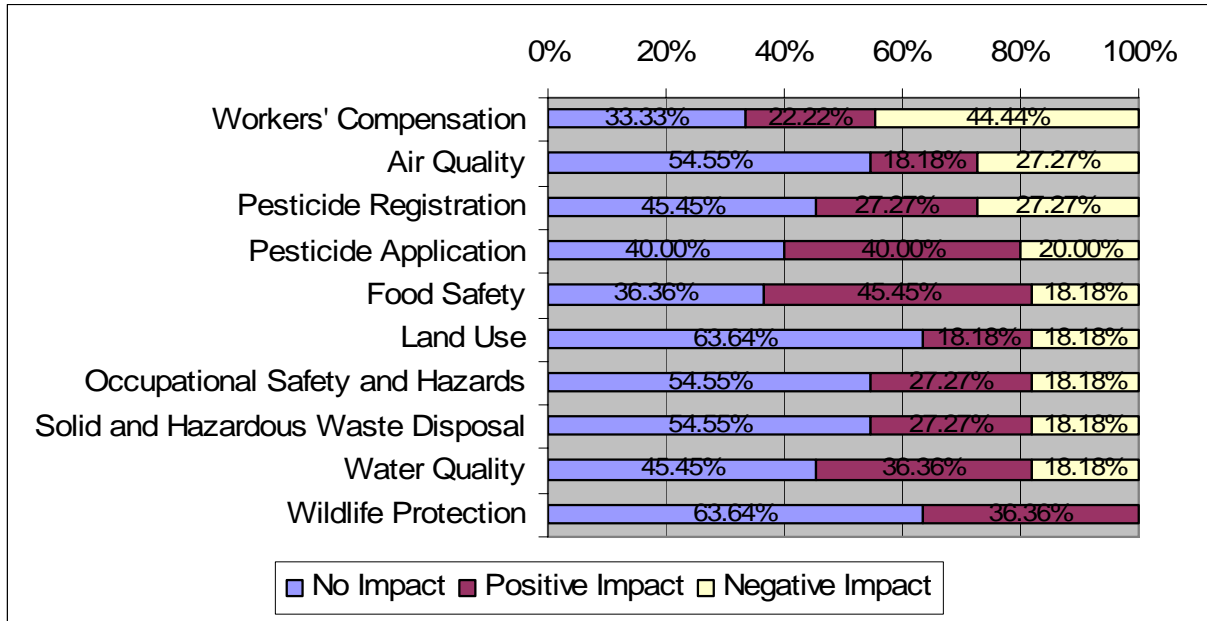


\*Producers had the opportunity to choose up to three of these areas.

Examining the question regarding the impacts of each of the regulatory areas affecting the leafy vegetable industry, similar conclusion given above can be drawn. Figure 3-45 shows that forty-four percent of leafy vegetable producers found workers' compensation negatively affecting their operations. Air quality and pesticide registration tied for the second ranking of negative impacts at twenty-seven percent of the producers. In every case except workers' compensation, the

percentage of producers indicating a positive impact by the regulatory area is equal to or greater than the group indicating a negative impact. Five out of ten of the regulatory areas had greater than fifty percent of the producers indicating that the regulatory area had no impact.

**Figure 3-45: Impact of Different Regulatory Areas on the Leafy Vegetable Industry**

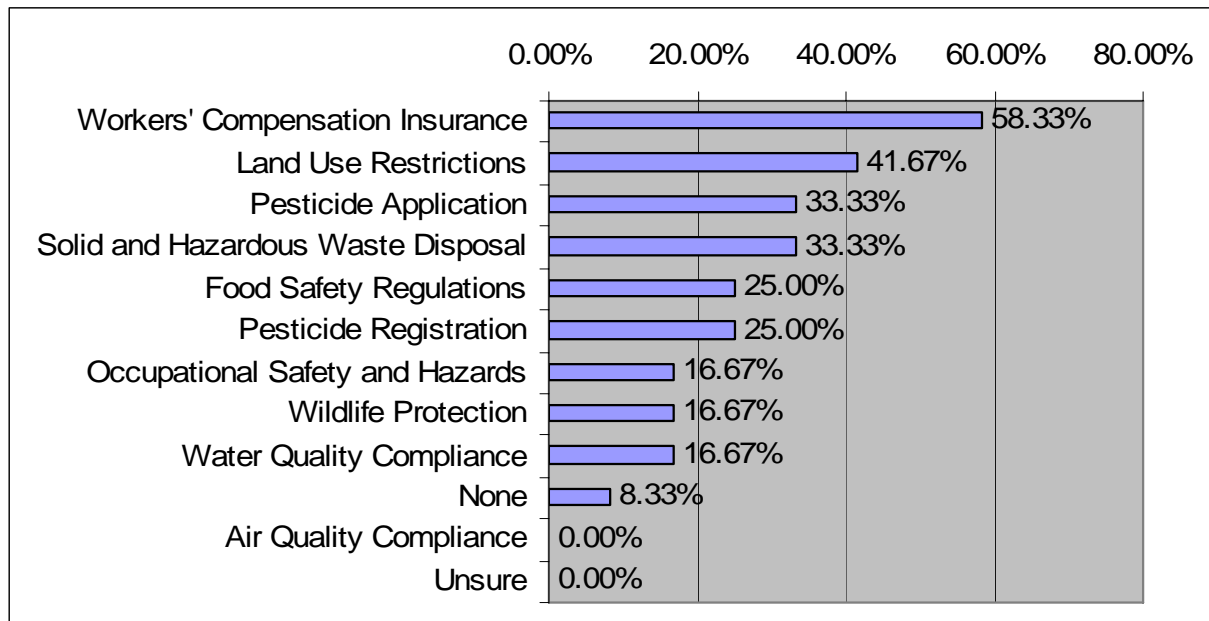


Results from the two survey questions examined in this section suggest that the leafy vegetable industry is not having much difficulty with regulations except for workers compensation. In many cases, it appears that these producers find that the regulatory areas have a positive impact to their operations over a negative impact. With only twelve producers representing this industry, it is difficult to say if this is representative of the industry. If you start with the premise that the survey would have a bias towards producers who are having difficulty the regulatory environment in California, this would suggest the leafy vegetable producers are not finding many problems with regulations. Given these results, only workers compensation is the only regulatory area that can be identified as an issue for these producers.

### Regulatory Areas Affecting the Miscellaneous Vegetable Industry

There were a few vegetable crops that did not fit well in the other groups of vegetables. These were Indian and sweet corn producers, water cress, artichokes, and what CASS defines as other vegetable producers. This group of producers will be identified as the miscellaneous vegetable industry. Figure 3-46 shows the results from the question asking the producers to indicate the top three regulatory areas increasing their operating cost. Like many other industries, workers' compensation is top of the list. Fifty-eight percent of the producers indicated that workers' compensation was one of the three areas increasing their operating costs. Land use restrictions were ranked second by these producers with nearly forty-two percent of the producers. Pesticide application and solid and hazardous waste disposal tied for the ranking of third with one-third of the producers indicating that it was a top three issue. Air quality compliance was the lowest ranked item with no producers indicating it as a top three area.

**Figure 3-46: Percentage of Miscellaneous Vegetable Producers Who Believe Operating Costs Have Increased Due to Regulatory Area\***

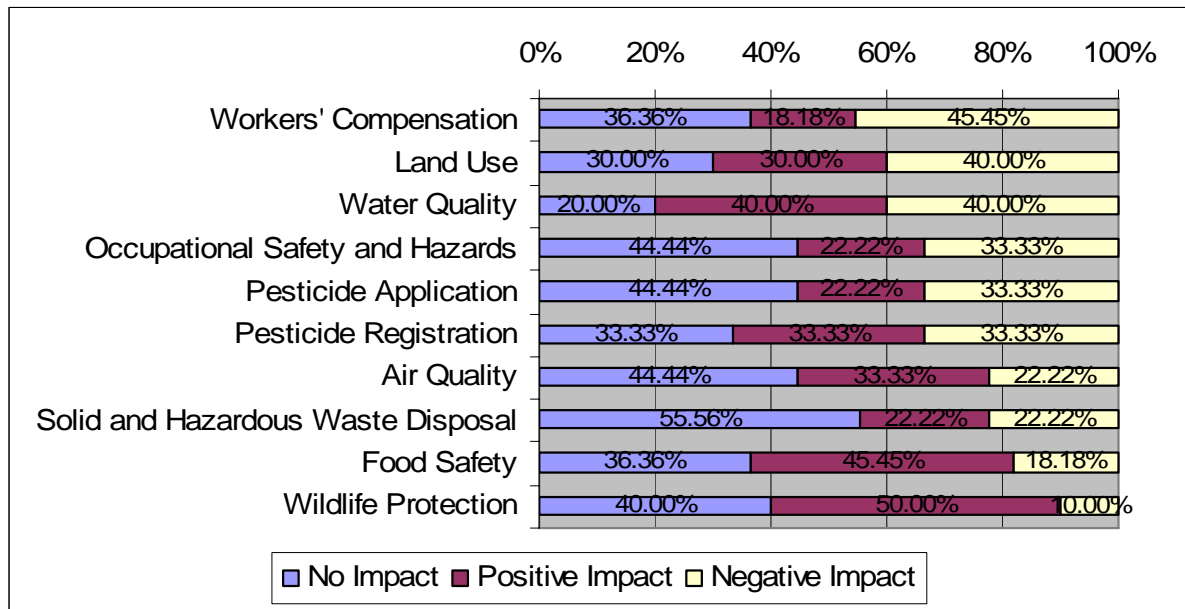


\*Producers had the opportunity to choose up to three of these areas.

As in the above figure, workers compensation and land use top the list for regulatory areas negatively impacting these producers operations. Workers compensation, shown in Figure 3-47, had forty-five percent of the producers indicating a negative impact, while land use garnered forty-percent of the producers for this question. Water quality tied with land use for the second

ranking area with the same percentage of producers. Occupational safety and hazards, pesticide application, and pesticide registration all tied for the fourth ranking area. Food safety and wildlife protection were the top two regulatory areas having a positive effect on producers in this industry. Solid and hazardous waste disposal had the highest percentage of producers indicating that it had no impact on the producers operation.

**Figure 3-47: Impact of Different Regulatory Areas on the Miscellaneous Vegetable Industry**

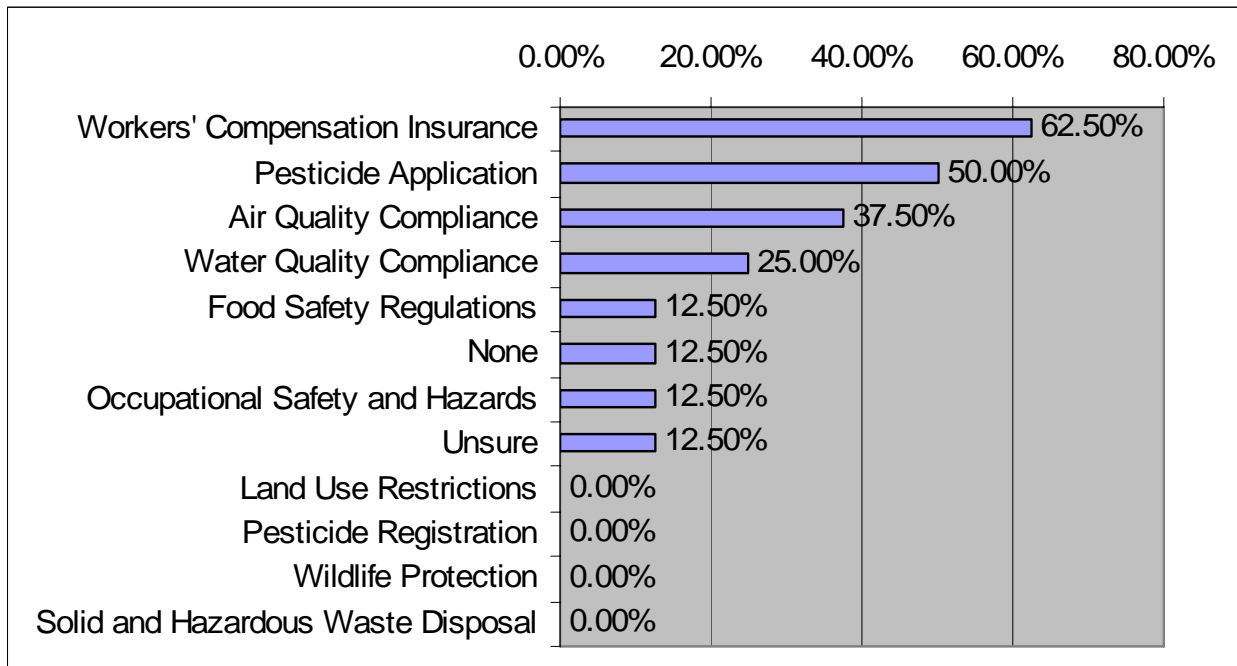


The top two regulatory areas that are causing the greatest effect to producers in the miscellaneous vegetable industry are workers compensation and land use regulations. Each of these areas was identified respectively first and second by producers both in increasing the producers’ operating cost and also in causing a negative impact to their operations. The third ranking item is less clear. While water quality regulations had one of the highest percentages of producers indicating a negative impact, this same area drops considerably in ranking when examining the regulatory areas increasing cost. On the other hand, pesticide application and solid and hazardous waste disposal were ranked third in terms of increasing producers cost, but they both drop when examining their overall effect on the operation.

### Regulatory Areas Affecting the Root Vegetable Industry

The root vegetable industry concurred with many of the other industries that workers' compensation is the top regulatory area increasing their operating cost. Figure 3-48 reveals that over sixty-two percent of root vegetable producers believe that workers compensation is a top three area. Pesticide application was ranked second by producers with fifty percent indicating that this area is increasing their costs. At over thirty-seven percent, air quality compliance ranked third for the areas increasing cost. Water quality compliance was ranked fourth. Land use, pesticide registration, wildlife protection, and solid and hazardous waste disposal all were at the bottom of the list with no producers indicating these issues as a top three.

**Figure 3-48: Percentage of Root Vegetable Producers Who Believe Operating Costs Have Increased Due to Regulatory Area\***



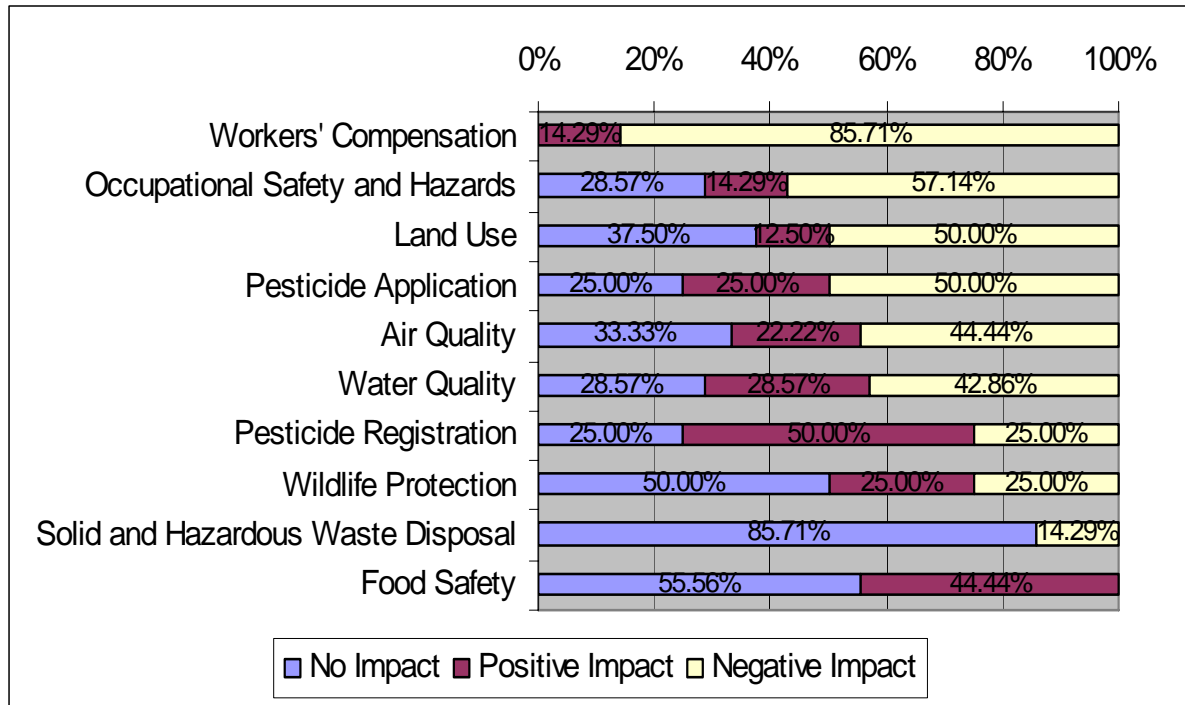
\*Producers had the opportunity to choose up to three of these areas.

Figure 3-49 shows that eighty-six percent of root vegetable producers believe that workers compensation has a negative impact on their operations. This was followed by occupational safety and hazards regulations ranking second with fifty-seven percent of the producers indicating a negative impact. Land use and pesticide application each received fifty percent of producers indicating a negative impact which would make these two areas tied for the third position. Food safety and pesticide registration were the two highest positive impacting



regulatory areas. Solid and hazardous waste disposal, as well as, food safety had the highest percentage of producers indicating that these areas had no impact to their operations. None of the producers believed that food safety regulations had a negative impact on their operations.

**Figure 3-49: Impact of Different Regulatory Areas on the Root Vegetable Industry**

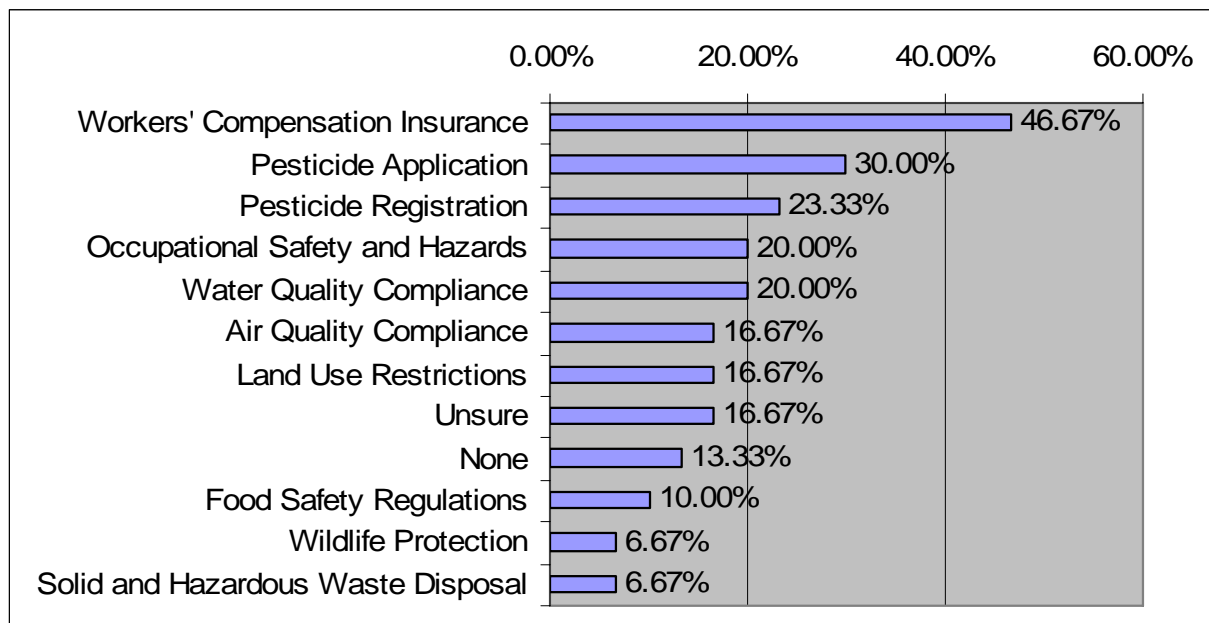


Two areas clearly stick out as top three regulatory areas for the root vegetable producers. These areas are workers’ compensation and pesticide application. Under both questions in the survey, they were ranked as top three items. As for the third regulatory area affecting these producers, it is less clear which area deserves to be in the top three. Land use and occupational safety and hazards were in the top three in terms of negatively impacting the producers overall operation, but they dropped considerably in the ranking when examining increased operating cost due to the regulatory area. Air quality compliance was ranked third for increasing operating costs, but fell to the fifth ranking when examining its impact on the overall operation.

### Regulatory Areas Affecting the Vegetable Vine Industry

The top regulatory area increasing the cost of the vegetable vine industry is workers' compensation. Figure 3-50 reveals that nearly forty-seven percent of producers in this industry identify workers' compensation as a top three area increasing their costs. Pesticide application was ranked second behind workers' compensation with thirty-percent of the producers identifying that it was one of the three areas increasing their operating cost the most. At twenty-three percent, pesticide registration was ranked third in this area. Tied for the fourth ranking regulatory area was occupational and safety hazards regulations and water quality compliance regulations. At the bottom of the producers ranking was wildlife protection and solid and hazardous waste disposal.

**Figure 3-50: Percentage of Vegetable Vine Producers Who Believe Operating Costs Have Increased Due to Regulatory Area\***

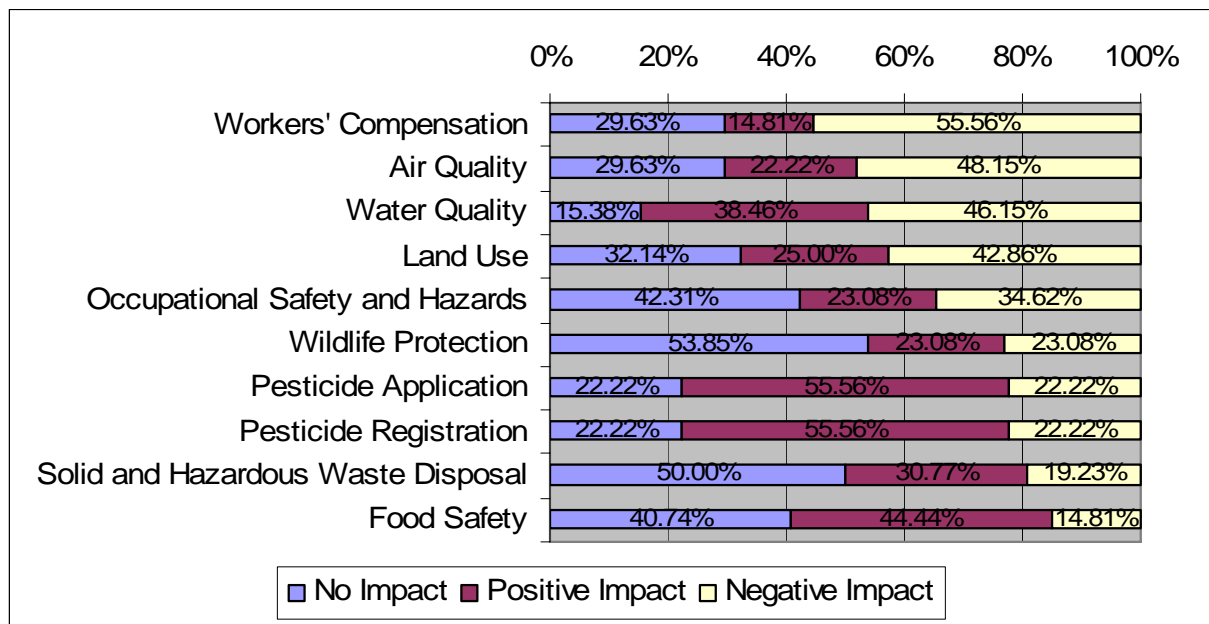


\*Producers had the opportunity to choose up to three of these areas.

When examining the impacts that each regulatory area has on the overall operation, Figure 3-51 shows that workers' compensation tops the list. Nearly fifty-six percent of producers indicated that workers' compensation had a negative impact on the producers operation. Ranked second and third respectively were air quality and water quality. The regulatory area of air quality had forty-eight percent of producers indicating a negative impact, while forty-six percent identified water quality regulations as having a negative impact. Land use and occupational safety and

hazards were ranked fourth and fifth. Two areas received over fifty-percent of the producers indicating a positive impact. Both pesticide application and pesticide registration at nearly fifty-six percent each were identified as having a positive effect to the producers operation. The percentage of producers who believe that these two areas had a positive impact on their operations is equal to the percentage of producers who believe that workers' compensation has a negative impact. Wildlife protection and solid and hazardous waste disposal each had at least fifty percent of the producers in this industry indicating that these two areas had no impact on their overall operations.

**Figure 3-51: Impact of Different Regulatory Areas on the Vegetable Vine Industry**



The area that is consistently in the top three rankings for the vegetable vine industry was workers' compensation which ranked first in both areas. The second and third ranking areas are not as clear cut. In terms of negative impact to the overall operation, air quality and water quality were ranked two and three. These each were ranked lower when examined for increasing the operating costs. From the standpoint of increasing operating cost, pesticide application and pesticide registration were ranked second and third. This would imply that while the two pesticide areas are ranked towards the top in terms of increasing the producers cost, the vegetable vine producers believe that the positive impact from having these regulations outweighs the increase in operating cost.

### **Summary of the Rankings from the Industry Analysis**

Examining how each regulatory area affects each industry of importance in this study, an identification of the top three regulatory areas was done above. A regulatory area was identified as a top three issue if it ranked in the top three for both increasing operating costs and having a negative impact on the producer. The list given below identifies which regulatory areas were ranked in the top three for a particular industry. It should be noted that the miscellaneous fruit industry was composed of commodities like avocados, olives, etc. The miscellaneous vegetable industry was made up of corn producers, water cress producers, artichoke producers, etc.

#### **Workers Compensation**

- Berry Industry
- Citrus Industry
- Deciduous Fruit Industry
- Miscellaneous Fruit Industry
- Stone Fruit Industry
- Grape Industry
- Horticultural Industry
- Tree Nut Industry
- Miscellaneous Vegetable Industry
- Root Vegetable Industry
- Vegetable Vine Industry

#### **Land Use**

- Berry Industry
- Miscellaneous Vegetable Industry

#### **Pesticide Registration**

- Citrus Industry
- Deciduous Fruit Industry
- Miscellaneous Fruit Industry

#### **Pesticide Application**

- Citrus
- Miscellaneous Fruit Industry
- Stone Fruit Industry
- Root Vegetable Industry

#### **Air Quality**

- Deciduous Fruit Industry
- Stone Fruit Industry
- Grape Industry
- Tree Nut Industry

## **Chapter 4: Issues Associated with Delayed Product Registrations in California Specialty Crops<sup>2</sup>**

### **Specialty Crop Production**

“Specialty crops” or “minor crops” include vegetables, fruits, nuts, herbs, nursery and flower crops. Other commodities such as corn, soybeans, wheat, rice and peanuts are classified as “major crops”. Over five hundred food and feed crops in the US are classified as specialty crops; these are grown on relatively small acreages and require intensive inputs. The value of these crops in the U.S. is approximately fifty-two billion dollars, which represents almost fifty percent of the total value of all crops (2004 USDA-ERS). It is generally recognized that this amount is increased approximately as value is added throughout the processing phase of agricultural products.

California is the most important region of specialty crop production in the United States, accounting for thirty-seven percent of US specialty crop value (UC Ag Issues Center). Per capita consumption of these types of products has grown exponentially due to increased concerns about general health, value of fruits and vegetables to nutrition, and health concerns such as heart disease, cancer, and obesity.

### **Integrated Pest Management (IPM) and Product Needs in Specialty Crops**

The production of specialty crops requires several inputs to promote vigorous plant growth and to control pests such as insects, weeds, nematodes and diseases. While retail sales of organic products (products grown without synthetic pesticides) has grown fifteen to twenty percent annually since 1990 (USDA-ERS, 2001), it is estimated that most agricultural commodities are grown using some degree of integrated pest management. IPM programs combine effective and environmentally sensitive tactics to manage pests with the least possible hazards to people, property, and the environment.

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<sup>2</sup> This chapter was prepared by Dr. Lori Berger with the California Minor Crops Council.

Goals of an IPM program include the following:

- Reducing the pesticide risk to the environment and protecting human health
- Increasing the predictability and effectiveness of pest management techniques
- Developing pest management programs that are economically and environmentally sustainable, as well as socially appropriate
- Increasing utilization of biological and ecologically based pest management programs

Pesticide products used in agriculture include naturally occurring and man made (synthetic) chemicals that control the diseases, insects, weeds and other life forms which harm or destroy agricultural and ornamental crops. Losses can be direct or indirect and may be reflected in yield, quality, or both. Pesticides can be applied to fields or seeds before planting - to protect the growing crop; to harvested produce - to prevent deterioration in storage; or during processing, packing and transport - to protect the quality, appearance and shelf life of foods. By their very nature, crop protection products have to be toxic to be effective against the target pest. Modern crop protection products are designed to have three key characteristics: they should be safe, specific, and short-lived.

IPM programs incorporate a variety of control methods that vary in effectiveness and risk to handlers. Less toxic or disruptive chemical controls are considered and used first (e.g., resistant varieties, pheromones, traps, mechanical destruction of hosts, etc.). If it is found through monitoring, that economic thresholds have been exceeded, additional pest control methods would be employed, such as targeted spraying of pesticides. Broadcast spraying of non-specific pesticides is a last resort.

In recent years, considerable time has been spent in identifying sources of risk exposure in agriculture. Clearly, product chemistry is the basis for safe pesticides, as well as appropriate field and application practices which separate worker both in space and time from chemical exposure.

Large chemical manufacturers tend to focus on large acreage crops (“major” crops) due to market potential and economic return on investment. As a result, specialty crops or “minor”

crops such as fruit, nut and vegetable crops are usually a very low priority for these firms and there have been traditionally fewer products developed for these niche markets.

## **Product Registration**

### **Federal Statutes – FIFRA, FFDCA, and FQPA**

EPA regulates pesticides under broad authority granted in two major statutes, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Federal Food, Drug and Cosmetic Act (FFDCA). Both of these were fortified in 1996 through the passage of the Food Quality Protection Act.

Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA): Requires all pesticides sold or distributed in the United States (including imported pesticides) to be registered by EPA through what is called a full Section 3 registration. EPA can authorize the limited use of unregistered pesticides or pesticides registered for other uses to address local emergencies (Section 18 registration) and special local needs (Section 24C registration). Amendments to FIFRA in 1988 established a re-registration procedure for pesticides that were first registered prior to 1984. The purpose of the re-registration process was to ensure that older pesticides conform to modern health and safety requirements. When necessary, manufacturers must provide more information on the toxicity and other properties of the pesticide. The pesticide is eligible for re-registration once the EPA has determined that enough information has been presented to demonstrate that no unreasonable risks to human health or to the environment will be incurred when the pesticide is used properly.

Federal Food, Drug and Cosmetic Act (FFDCA): Requires EPA to set pesticide tolerances for all pesticides used in or on food. A tolerance is the maximum permissible level for pesticide residues allowed in or on commodities for human food and animal feed.

Food Quality Protection Act (FQPA): Passed almost 10 years ago, this statute amended both FIFRA and FFDCA requirements for EPA to rule that a pesticide poses a "reasonable certainty of no harm" by adding several safety features to establishment of a tolerance. Specifically, these include aggregate and cumulative risk; in addition, the dietary intake of infants and children and potential exposure to pesticide residues. This law also requires EPA to determine if the pesticide in question produces hormonal type effects in humans (also called endocrine disruptors). EPA is currently in the process of reviewing older pesticides in accordance with provisions of the Food Quality Protection Act; this process is called re-registration and review of several thousands products is due for completion in late 2006. EPA also prioritized review of pesticide products in 1997 and launched an aggressive program which evaluated several pesticides found to be present as residues on fruits and vegetables.

### **Process for New Product Registration at US EPA**

The process of registering a pesticide is a scientific, legal, and administrative procedure which involves many people and can take up to several years to complete for a new active ingredient (<http://www.epa.gov/pesticides/regulating/registering/>). A Federal registration action to approve a pesticide occurs only after a thorough investigation of the pesticide's ingredients, intended uses, toxicity, and related characteristics have been examined. The manufacturer is required to provide a great deal of data to EPA; the Agency must then evaluate whether a pesticide has the potential to cause adverse effects on humans, wildlife, fish, and plants, including endangered species and non-target organisms, as well as possible contamination of surface water or ground water from leaching, runoff, and spray drift. Potential human risks range from short-term toxicity to long-term effects such as cancer and reproductive system disorders. EPA examines the ingredients of the pesticide; the particular site or crop on which it is to be used; the amount, frequency, and timing of its use; and storage and disposal practices.

The use of the pesticide must not result in illegal residue levels in food or feed. In some cases, the EPA will issue conditional registrations under which use of the pesticide is permitted until further testing shows whether or not the pesticide is problematic. As part of the registration process, the EPA determines what language should appear on the product label. Use of a product inconsistent with the information and instructions on its label is illegal.



The objective of the registration process is to examine the product behavior in the environment, its effectiveness against targeted pests, its hazards to non-target organisms, its effects on fish and wildlife, the degree of worker exposure, and its chemistry. Ultimately, regulatory agencies would like to assure that products used according to label instructions will cause no adverse effects. Pesticides that pass this scientific, legal, and administrative process are granted a license that permits their sale and use according to requirements set by state and federal authorities to protect human health and the environment; this license is called a registration.

EPA has separate review processes for three categories of pesticides, antimicrobials, biopesticides, and conventional products. Of these three categories, there are different data requirements and review policies that registrants must take into account in their submittal. Conventional pesticides, i.e., those that are synthetic (not naturally produced) have the greatest data requirements in order to assure the public that they are safe to use.

The process of registering a pesticide begins with submission to EPA of an application package. EPA's review of this application includes assessment of the hazards to human health and the environment that may be posed by the pesticide. Depending on the class of pesticide and the priority assigned to it, the review process can take several years. Biopesticides and reduced-risk conventional pesticides often can complete the process much faster.

### **Process for New Product Registration at California Department of Pesticide Regulation**

Similar to federal requirements, state law requires that before a pesticide can be marketed and used in California, the California Department of Pesticide Regulation (CDPR) must evaluate it to ensure it will not harm human health or the environment. Registrants must therefore provide additional data to CDPR after products have gone through the federal registration process.

Pesticides that pass CDPR's scientific, legal, and administrative process, which is very similar to the U.S. EPA's process, are granted a license that permits their sale and use in the state. A graphic representation of the California registration process can be found at

<http://www.cdpr.ca.gov/docs/registration/change/trkprocess.pdf>.

Data requirements for a California registration include the following:

- Acute toxicology data on the formulated product
- Product chemistry data
- Residue chemistry data (limited)
- Efficacy data (reduced requirements due to recently passed legislation in 2005)
- Phytotoxicity data if used on a plant
- Fish and wildlife data, if applicable
- Chronic toxicology data, if product contains a new active ingredient to California
- Environmental fate data for the first agricultural use of the active ingredient in California
- Medical management data, if product contains a new active ingredient to California

In 2004, California Department of Pesticide Regulation (CDPR) publicized plans to reduce state restrictions on the registration of new pesticides and rely more heavily on federal regulations in order to save money and accelerate the approval of new pesticides. The plans were published in the California Performance Review, a 2,500-page report on proposed state government reorganization that was made available to the public on August 3, 2004.

California is known for having state pesticide safety restrictions that are stricter than federal regulations. However, the report claims that California's state regulations often only duplicate federal regulations and slow the registration of new pesticides. In certain special cases where registrants claim their products have safer toxicological profiles, registration packages can be reviewed concurrently with US EPA.

### **The Role of IR-4 in the Registration of New Products for Specialty Crops**

Products in the research and development phase are established by companies (registrants) that have proprietary rights to the active ingredients. Their priorities are communicated to USEPA which develops an annual work plan (<http://www.epa.gov/opprd001/workplan/newchem.html>). As there are significant commercial opportunities at stake for these manufacturing firms, priorities established by the companies are usually reflective of economic potential for each

active ingredient; these are typically for crops such as corn, soybeans, cotton, and other major crops.

In order to defray the costs of product research for specialty crops, a congressionally mandated program exists called Interregional Research Project Number 4 (IR-4). This USDA run program identifies product uses that will not be pursued by the registrants but that are important to the minor crop industry. They in turn prioritize and fund studies to pursue those registration. Without this important program, there would be very few pesticide registrations in specialty crops.

IR-4 was established and is still needed today because there are insufficient financial incentives for the agrochemical industry to invest in registering their products in specialty crops. Additionally, there are potential liability issues from crop injury in low acreage, high value crops that may create unfavorable risk-reward relationships for registrants. IR-4 develops the data to support the registrations. In doing so, IR-4 helps to improve the international competitiveness of US agriculture. As the agrochemical industry continues to undergo worldwide consolidation, the resources devoted to specialty and minor crops uses continue to diminish. This makes the role of IR-4 increasingly critical for maintaining the efficient and competitive production of these high value crops in the US.

The need for IR-4 was reinforced in 1996 by the passage of the Food Quality Protection Act (FQPA). This required that nearly all the 10,000 pesticide tolerances in effect in 1996 be reassessed over a ten-year period and every fifteen years thereafter. Significant losses of important uses of older compounds have and will continue to occur. EPA has given priority to the registration of replacements for organophosphate insecticides with Reduced Risk chemicals. Reduced Risk chemicals have been the major focus of the IR-4 effort in the last five years. Since new and improved chemicals will continue to be marketed, continued regulatory action against older, widely used, chemicals is inevitable. In addition, the re-registration of all active ingredients is now set on a recurring fifteen year cycle.

## **Registration Priorities and Costs Associated with New Product Development**

Costs associated with the research and development of new crop protection pesticides are significant. CropLife America, a pesticide registrant trade association, estimated that these costs (from discovery and bringing to market) to be in excess of \$184 million (U.S.) in the year 2000. The time taken to put a new product on the market following discovery has also increased and is now more than 9 years. In 2000, CropLife reported the following:

- On average, it costs over 180 million dollars to discover, develop and register each new crop protection product. This cost is eight times higher than what it was twenty years ago.
- Nearly 140,000 molecules were screened in order to discover and bring to market one new crop protection product. From 1995 to 2000, this number has increased from 52,500.
- The development period – from first synthesis (discovery) to commercialization – for a new product has increased from 8.3 years in 1995 to over nine years.

These increases can be attributed to more rigorous regulatory standards as well as stricter criteria applied by companies during the development stage to ensure protection of the environment and the consumer. One must also consider that these estimates are reported for new products registered on major crops such as corn and soybeans; it takes an additional period of two to five years for these products to be made available to specialty crops.

## **The Post-FQPA Era for Specialty Crops**

Concerns about organophosphate (OP) and carbamate insecticides were heightened as a result of National Research Council Report on Pesticides in the Diets of Infants and Children (1993). This document proved to be the foundation for the establishment of the Food Quality Protection Act of 1996 which incorporated health based safety standards into risk assessment procedures.

The benefits of organophosphates and carbamate products are well documented and they are considered to be responsible for significant increases in agricultural productivity in the last several decades. Casida and Quistad (1998) reported that by 1995, organophosphate insecticides

accounted for over one-third of pesticide sales worldwide. When FQPA was passed, forty-nine OP pesticides were registered for use in pest control in the United States; since then, many uses have been canceled or restricted and others are expected to be lost, with particular significance for California growers. A UC study published in 2002 (Metcalf, et al.) showed that if all organophosphates were eliminated from specialty crop production, losses in excess of two hundred million dollars would be experienced by growers and consumers. As reported by Van Steenwyk (2005), overall pesticide use may actually increase if adequate replacement products and techniques are not made commercially available to growers.

In its report outlining concerns about pesticide residues and worker safety, the Consumers Union (1998) reported that the use of OPs and carbamates on certain crops such as apples and peaches is high compared to that on other fruit crops. Methyl parathion was found to be the most widely used insecticide in peach production; roughly half the acres surveyed by USDA in 1995 were treated with this high-risk chemical. This product was eventually cancelled in 1999 to address concerns about dietary risks to children and worker safety.

The efforts of EPA help to assure consumers and workers that all products, especially older, broader spectrum products meet current safety standards. The re-registration and review process resulting from FQPA will help to identify actions to reduce risks from pesticides, such as establishing or enlarging buffers to protect surface water bodies, changing the amount or frequency of use of a pesticide to reduce exposure, limiting use of the pesticide during periods when a non-pest species might be affected, eliminating or modifying uses that pose unacceptable risks to humans.

### **Reduced Risk**

In order to promote the use of safer chemistries and availability of commercial products, EPA gives priority in its registration program for pesticides that are classified as “reduced risk”. It also expedites registrations for products which are considered to be organophosphate and methyl carbamate replacements.

Criteria for “Reduced Risk Classification” by EPA are qualitative and include the following:

- low-impact on human health
- low toxicity to non-target organisms (birds, fish, and plants)
- low potential for groundwater contamination
- lower use rates, low pest resistance potential
- compatibility with Integrated Pest Management (IPM)

### **Resistance Management**

The lack of a wide variety of pesticides in specialty crops can contribute to overuse of certain products resulting in pesticide resistance where effectiveness is lost over time due to metabolic tolerances built up in target pest populations. Pesticide resistance develops when pesticides are used too often and when the same pesticide or similar pesticides are used over and over again. Pesticide resistance is managed most effectively by using pesticides only when necessary, using selective pesticides that break down quickly, and alternating “modes of action” (i.e., means by which target is biochemically affected). Since specialty crops generally do not have as great a variety of pest management tools available for use, there is often intense selection pressure for pests to develop resistance. Only when a variety of products can be used, will there be a reduction in this potential.

### **Need for Replacement Products and Rotational Products**

From both the statutory aspect and concerns expressed by consumer groups, there is a clear need for the specialty crop sector to utilize pest management tactics which have elevated standards of safety. During the late 1990s, there was great concern that insufficient emphasis at the R&D level would not fulfill the commercial needs of specialty crop sector. Presently, there are few incentives for registrants to develop or maintain minor crop uses on their product labeling. High costs and risks associated with developing and maintaining supportive data packages necessitate a focus on major crops such as corn, soybeans, cotton, rice, and wheat. Other concerns associated with minor crops include product liability claims, limited research and development resources, and possible unfavorable impacts on dietary and non-dietary risk assessments.

Possible solutions to this crisis situation include incentives for pesticide chemical producers to pursue minor crop use registrations, product liability relief, a more involved minor crop grower community, and additional funding for the IR-4 program. Since FQPA, several EPA and USDA research programs have supported research in the area of reduced risk pest management and we have seen significant progress in adoption of new technologies. There still remains considerable work ahead, as biological systems are not static, and there have been shifts in the importance of pests in many of the crops due to changes in pest management tactics.

### **Problem Statement**

*While California seeks to be a leader in specialty crop production and innovative, reduced risk pest management, the established regulatory framework often limits the availability of safer products and is considered costly to growers.*

The CDPR has, in the past, not allowed certain pesticides to be used in California even though the federal Environmental Protection Agency (EPA) has deemed them safe. It has been suggested that the Department of Pesticide Regulation's process for registering new pesticide duplicates federal registration processes that already provide adequate protection to stakeholders. There is concern that duplication of effort does not significantly improve public health or the environment and that these regulatory delays are ultimately costly for growers and the business environment.

### **Objectives**

The primary objective of this chapter is to evaluate some of the issues surrounding regulatory constraints for tree, vine, vegetable, nursery, and forestry producers in California.

As discussed in a previous section, US EPA registration precedes California registration in most cases. It is often noted that pesticide registration in California is a lengthy process which could present a competitive disadvantage to California growers by delaying the availability of newer, more effective and perhaps less expensive products in our state. The following work looks at causes and potential economic impacts of delays in the California regulatory process following the registration pathway of three federally registered products, approval of which was

excessively delayed, or ultimately denied, due to California requirements. The study had four major objectives:

- To characterize registration delays in the California regulatory system for three federally registered products
- To determine where in the registration review process delays were encountered
- To determine if this delay could be related to increased costs for pest control
- To relate delays in registration to achievement of reduced risk pest management or resistance management goals of California and Federal regulatory authorities

## **Methods**

Pesticide products for this study were selected because they represented reduced risk alternatives to existing pesticides (e.g., organophosphate or carbamate replacements) or they were of potential use in resistance management programs.

Company representatives and available information regarding CDPR registration reviews were obtained. Comments from registrants (Maketeshim-Agan, Bayer Crop Sciences, and Dow AgroSciences) were solicited and compiled into three case studies to track US versus CDPR registrations. Data for each case study included: product and pest control information, registration timelines for US EPA and CDPR registrations, and key findings on causes for registration delays in the California system. Where available, information on product costs were collected to determine differences between available products and pest management practices which reduced risk with new products versus use of older pest management programs using “traditional” products.

One of the case studies was selected to do a more in depth analysis of reduced risk pest management; the commodity selected was fresh peaches, a crop which has come under intense scrutiny since passage of FQPA in terms of organophosphate insecticide use. The importance and costs of reduced risk and conventional pesticides in California and other US peach production states was evaluated where possible. Empirical data was acquired where possible; otherwise, expert opinions were sought. This project was intended to consider only the factors



discussed in this report and is not intended to be a comprehensive review of all factors that might impact the costs of fresh peach production and the efficacy of all products for pest control.

Information not directly related to the relative costs and efficacy of various products is presented for comparison and information purposes only. Product prices were obtained through local vendors and crop values shown in the tables and graphs are in nominal dollars (unadjusted for inflation).

## **Results And Discussion**

### **Novaluron (Rimon<sup>®</sup>) Reduced Risk Insecticide/OP Replacement Product**

Rimon<sup>®</sup> is a reduced risk replacement for certain organophosphate pesticides, including azinphosmethyl. It is manufactured by Makhteshim-Agan of North America (MANA); the label for this product is included in the Appendix. Rimon<sup>®</sup> is a chitin synthesis inhibitor-insect growth regulator (IGR) and will have utility against codling moth in pears. Rimon<sup>®</sup> also has activity against a myriad of other insect larvae. It is active against plant chewing and mining insects of the orders of Lepidoptera and Coleoptera and plant sucking insects of the orders of Homoptera. Rimon<sup>®</sup> will be useful in situations where such pests occur together on crops such as Cotton, Cucurbits, Potatoes, Tomatoes, Brassicae and Citrus.

- Benzoylphenyl urea insecticide (EPA Reg No. 66222- 35-AA) manufactured by MANA
- Insect Growth Regulator (IGR) and Reduced risk pesticide; OP Replacement (azinphos methyl) primary utility will be against codling moth in apples and pears
- Soft on beneficials
- CAS # 1167114-46-6
- Brand names include Rimon<sup>®</sup> is a chitin synthesis inhibitor
- Activity against a myriad of insect larvae of the orders of Lepidoptera, Coleoptera, Homoptera and Diptera. Active against plant chewing and mining insects of the orders of Lepidoptera and Coleoptera and plant sucking insects of the orders of Homoptera. Will be useful in situations where such pests occur together on crops such as Cotton, Cucurbits, Potatoes, Tomatoes, Brassicae and Citrus

- Citrus: whitefly, leaf miner, fruit borer
- Pome Fruits: Codling moth, stem borers, leaf miners, tortricids
- Stone Fruits: Fruit borers
- Vegetables: Caterpillars, whitefly, leaf miners
- Potato: Tuber moth, Colorado potato beetle
- Tomato: Tuber moth, leaf miners, whitefly

**Table 4-1: Registration timeline for Rimon®**

<b>EPA</b>	<b>Comments</b>
9/2001	Conditionally registered at EPA (ornamentals grown in greenhouses)
5/2004	Additional uses registered on pome fruits, potatoes and cotton
<b>CDPR</b>	<b>Comments</b>
8/2001	Registration package submitted to CDPR with use on ornamentals
9/2002	Conditional registration approved for use on ornamentals
9/2003	Conditions removed from label - full registration granted for use on ornamentals
8/2004	Food use package submitted to CDPR. Label to include use on apples, pears, and potatoes
1/2006	Not yet registered by CDPR; currently under review in the Worker Health & Safety station which is the only station yet to complete their review of the package. New active ingredient registrations are sent concurrently to all designated review stations. Rimon® has been in Worker Health & Safety for 437 days. It has been reviewed and “Recommended To Register” by reviewers in Product Chemistry, Med Tox, Pest & Disease Prevention, Fish & Wildlife and Plant Physiology.

Rimon® was conditionally registered by USEPA for ornamentals grown in green houses in September of 2001 (Table 4-1). An application for registration of Rimon® for ornamental uses was submitted to CDPR in August of 2001. California issued a conditional registration a year later (September, 2002). CDPR was concerned about potential phytotoxicity to certain ornamentals and asked for additional testing before issuing a full label. The additional data was developed and an unconditional registration for ornamental uses was granted in September of 2003. In May, 2004, USEPA approved additional uses on pome fruits, potatoes and cotton. In August of 2004, an application for uses on apples, pears and potatoes was submitted to CDPR. As of January of 2006, CDPR has yet to register these uses.

The registrant is not aware of any particular problems preventing approval of the amended label. MANA voluntarily submitted additional back-up data to support studies on oral toxicity in rats. An appendix was inadvertently left out of the 13 day oral toxicity study in rats, which was submitted in May, 2005. MANA submitted USEPA Data Evaluation Report Summaries

(DERS), which are summaries of US EPA’s reviews, in November 2004. MANA submitted the DERS after CDPR adopted a policy to accept them as part of the registration application (California Notice to Registrants 2004-6).

The active ingredient in Rimon® is a new active ingredient in California. New active ingredient registrations are sent concurrently to all designated review stations. This product has been reviewed and recommended for registration by product chemistry, medical toxicology, pest & disease prevention, fish & wildlife and plant physiology reviewers. The only review still outstanding is worker health & safety. The package has been in this station for over 430 days.

This product has been in review in the Worker Health and Safety Branch of CDPR for over 430 days. All other evaluation stations have completed their reviews and recommended registration. The registrant is not aware of any particular problem with the data that has caused this delay. CDPR reviewers have not requested additional data. Therefore, at this point the statutory basis for delay of this registration is the general obligation, under the Food and Agricultural Code, for CDPR to evaluate pesticide products for their potential to cause worker illness prior to registration in the state.

**Table 4-2: Use rates and costs for selected codling moth control products for apples in CA**

Trade Name	Chemical Name	Std. Use Rate/A	Cost Product \$/A
CheckMate® pheromome	E-E 8,10-dodecadiene or isomer	100 - 400 units	33.00 -125.000
Guthion® 50WP insecticide	azinphos-methyl	3 #	37.50
Imidan® 70WP insecticide	phosmet	5#	43.25
Confirm® 2F insect growth regulator (IGR)	tebufenozide	20 oz	35.35
Rimon® insect growth regulator (IGR)	novaluron	Not registered	Not registered

Cost data for codling moth control shows that reduced risk products such as pheromones at low rates are competitive with conventional products (Table 4-2). Use of pheromones and IGRs will likely require repeated applications; therefore, costs may ultimately be more expensive than traditionally used OP products such as Imidan and Guthion which are both very effective. The availability of OP replacements is desired for reduced risk management of codling moth, a critically important pest of apples (see UC IPM Guidelines for Apples in Appendix H).

### **Propamocarb (Previcur®) Fungicide**

Propamocarb is a product manufactured by Bayer Crop Science; the label for this product is included in the Appendix H. Previcur® is a fungicide that has activity against oomycete species which cause seed, seedling, root and stem rots and foliar diseases in many edible crops and ornamental plants. This product is not a methyl carbamate and does not inhibit cholinesterase; therefore, it is not the type of carbamate with an FQPA risk reduction focus.

- Carbamate fungicide manufactured by Bayer Crop Science
- CAS # 25606-41-1
- Brand names include Previcur®, Banol®, Prevex®

**Table 4-3: Registration Timeline for Previcur®**

<b>EPA</b>	<b>Comments</b>
9/2000	Conditionally registered at EPA (potatoes only)
2/2002	Fully registered at EPA (potatoes only)
7/2004	7/2004 Vegetables formally approved by EPA on the label (Vegetables include tomatoes, peppers, cucurbits, lettuce)
<b>CDPR</b>	<b>Comments</b>
7/2001	Section 18 (tomatoes only) in California
7/2002	Section 18 expired
8/2002	Bayer submitted application for registration on potatoes.
8/2004	Bayer submitted data to add additional crops including cucurbits, lettuce and field and greenhouse tomatoes
1/2006	Product still not registered

Previcur® was conditionally registered by USEPA for potatoes only in September of 2000 and full registration on potatoes was granted in February, 2002 (Table 4-3). Vegetables, including tomatoes, peppers, cucurbits, and lettuce were added to the federal label in July, 2004. The California Department of Pesticide Regulation approved a Section 18 Emergency Exemption from Registration for Previcur® on tomatoes in July of 2001, which expired one year later. Bayer submitted an application to the CDPR for registration on potatoes in August of 2002. Bayer submitted an application for an expanded label to include cucurbits, lettuce, and field and greenhouse tomatoes in August of 2004. As of December, 2005, the California registration is pending approval.

Registration of this active ingredient in California has been delayed by concerns of CDPR reviewers in two evaluation stations, Worker Health & Safety and Environmental Fate.

CDPR required a 24-hour Re-entry Interval (REI) for workers entering treated fields. EPA conducted a review of this active ingredient and issued an Interim Reevaluation Document (IRED) in 2001. In the IRED, EPA stated that re-entry intervals should be twenty-four hours or greater. The only uses approved by EPA at the time of the IRED review were for turf. Subsequently, EPA approved other crop uses for Previcur<sup>®</sup> and agreed with the registrant that shorter (twelve hour) REI's were appropriate. However, EPA did not revise the IRED which had already been issued. Therefore, the EPA approved label allowed for twelve hour REIs, and it was this label the registrant sought to register in California. California reviewers refused to recommend registration of the product unless the REI was increased to twenty-four hours. It was CDPR's contention that the twenty-four hour REI required by the RED (pre-2002) precluded EPA's more recent decision on the REI. The Worker Health & Safety reviewers believed that the IRED trumps an approved label, even if the label is approved after the IRED has been issued.

At Bayer's urging, EPA's Product Manager recently contacted CDPR reviewers and reportedly convinced them to reduce the REI to twelve hours. This will make the product more amenable to the needs of growers, PCAs, and workers needing to enter the fields on a timely basis to tend to various production activities.

CDPR's Chemistry Branch reviewers have not accepted Bayer's aerobic soil metabolism study. Although EPA has found the Bayer aerobic soil metabolism study to be acceptable; CDPR has not. EPA requires that, for this study, soil metabolites of active ingredients be identified down to a level of fifty ppb or ten percent of the parent material, whichever comes first. Bayer complied by identifying metabolites down to the ten percent level. CDPR's policy is to require metabolites to be identified down to the fifty ppb level, not to ten percent of the level of the active ingredient.

Bayer agreed to conduct another study and asked CDPR for a conditional registration. CDPR denied the request because aerobic soil metabolism studies are considered part of the data required by the Groundwater Protection Act (AB 2021) and conditional registrations cannot be issued unless all of the data requirements for this Act have been fulfilled. The new soil

metabolism study has not been completed. Bayer requested that CDPR review the new soil metabolism study protocol before they initiated the work. According to Bayer, CDPR took an extraordinarily long time to even begin to look at the proposed protocol. In the meantime, Bayer initiated the study. CDPR recently came back to Bayer and told them they still have concerns with components of the study.

There are two main causes of delay in the evaluation process for this product. First, the Worker Health and Safety reviewers, under their general obligation to evaluate the potential for a pesticide to cause worker illness, made a policy decision to follow EPA’s conclusions as stated in the Interim Re-registration Evaluation Document, instead of EPA’s decision in approving the federal label. Second, under the Groundwater Protection Act statutes, CDPR reviewers have established a different standard for quantifying the level to which metabolites of an active ingredient must be determined for an acceptable anaerobic soil metabolism study. This “science policy” has resulted in the need for the registrant to re-do the study to meet CDPR’s requirements for acceptability.

**Table 4-4: Use rates and costs for selected late blight control products for tomatoes in CA**

Trade Name	Chemical Name	Std. Use Rate/A	Cost Product \$/A
Quadris® fungicide	azoxystobin	6.2 oz	13.95
Dithane M-45 fungicide	mancozeb	2 #	6.30
Cabrio® EG fungicide	pyraclostrobin	12 oz	20.14

Cost data for late blight control in tomatoes shows that the newer products such as Quadris® and Cabrio® are more expensive per acre than the older products such as Dithane (Table 4-4).

Previcur® is not currently registered in California, but costs are not expected to exceed these other products. According to the federal label, Previcur® should be used in a tank mix combination, so product costs per acre will include the additional product. The availability of an alternate product such as Previcur® is desired to add to products currently available for management of late blight, a potentially serious disease of tomatoes in California (see UC IPM Guidelines for Tomatoes in Appendix H).

## **Methoxyfenozide (Intrepid®) Reduced Risk Insecticide/OP Replacement Product**

Intrepid® is a reduced risk replacement for organophosphate insecticides. It is manufactured by Dow AgroSciences (DAS); the label for this product is included in Appendix H. Intrepid® is an insect growth regulator (IGR) which mimics the action of the molting hormone of lepidopterous larvae. It has activity against various insects on pome fruit, grapes and cotton. Intrepid® won the 1998 President's Green Chemistry Challenge Award, which indicates that EPA considers it a step forward in environmentally responsible pest management.

- Reduced Risk Insecticide manufactured by Dow Agro Sciences (DAS)
- OP Replacement
- Insect Growth Regulator (IGR) which mimics the action of the molting hormone of Lepidopterous larvae
- CAS # 161050-58-4
- Brand name(s) include Intrepid® 2F (EPA Reg No 62719- 442-AA)
- Activity against various insects on pome fruit, grapes and cotton
- Won the 1998 President's Green Chemistry Challenge Award

Intrepid® was first registered for use in the US by Rohm and Haas in September of 2000 (Table 4-5). Initial uses were for pome fruit, grapes and cotton. That same month, an application for California registration on the same crops was submitted to the California Department of Pesticide Regulation (CDPR). In May of 2001, CDPR concluded their review of the Intrepid® application and proposed to deny the application. In 2001, Rohm & Haas was purchased by Dow AgroSciences and Intrepid® became a DAS material. A little over a year later (July, 2002), DAS responded to CDPR's denial letter.

**Table 4-5: Registration timeline for Intrepid®**

<b>EPA</b>	<b>Comments</b>
9/2000	Registered for use on pome fruit, grapes, and cotton by Rohm & Haas
6/2001	DAS purchased Rohm & Haas
9/2002	Additional use registered on stone fruit
5/2003	Additional uses registered on peas, okra, and Crop Group 9 (cucurbit vegetables)
12/2003	Additional uses registered on peas, okra, and Crop Group 9 (cucurbit vegetables)
9/2004	Additional uses registered on Crop Group 2 (Leaves of Root and Tuber Vegetables), Subgroup 6A (Edible-Podded Legume Vegetables) and 7A (Foliage of Legume Vegetables), and papaya, mango, peppermint, strawberries, and more
<b>CDPR</b>	<b>Comments</b>
9/2000	Submitted to CDPR for use on cotton and pome fruit.
5/2001	Proposed to deny by CDPR (32 page denial document sent to Rohm & Haas).
6/2001	DAS purchased Rohm & Haas.
7/2002	DAS sent response and rebuttal with additional data to CDPR. DAS reports that approximately half of the delay in responding to CDPR was the result of the purchase of Rohm & Haas.
5/2003	Intrepid® registered with minimal crops (cotton and pome fruits).
9/2003	Label amendments submitted by DAS to insert use on stone fruits. DAS reports that it took one year to run efficacy trials and deliver final reports to CDPR to add this use.
1/2004	Registration for stone fruit

In their correspondence, CDPR cited seven primary reasons for denying the registration. CDPR's points and the DAS rebuttal follow:

- 1. CDPR concern.** The registrant did not supply one year storage stability study.

**DAS response.** Provided a 2 year storage stability study in July, 2002, which was accepted by CDPR. It should be noted that it is not uncommon for CDPR to grant a conditional registration for a product knowing that the Storage Stability Study is underway and forthcoming. If this was the only deficiency in the data package, we would have expected CDPR to grant a conditional registration.
- 2. CDPR concern.** The registrant needs to provide Limit of Quantification (LOQ) of methoxyfenozide and recovery data for Test Method 94-136-02.

**DAS response.** DAS successfully argued that both the LOQ and Recovery Data would neither be determined nor required under this Test Method.
- 3. CDPR Concern.** The registrant needs to provide Limit of Quantification (LOQ) of methoxyfenozide for Test Method 98-210-01.



**DAS response.** Successfully argued that the LOQ should not be a requirement for this test method.

4. **CDPR concern.** The registrant needs to provide acceptable environmental fate studies for methoxyfenozide for the following Environmental Fate studies:

- Anaerobic soil metabolism
- Field dissipation (two studies)

*[Note: Environmental Fate studies are required by law for terrestrially applied pesticides to provide information on the potential for the chemicals to leach to groundwater. These studies were submitted with the original Rohm & Haas application but were determined to be unacceptable by CDPR].*

**DAS response.** For the anaerobic soil metabolism study, DAS provided additional detail and successfully rebutted CDPR's assertions. For the field dissipation studies, additional detail and arguments were presented and the studies were accepted as fulfilling the data requirements. It is unclear to what extent the results of the long term soil accumulation study discussed below (paragraph 6) influenced CDPR's final decision on this requirement.

5. **CDPR concern.** The registrant needs to provide the chemical composition of the inert ingredients:

- Atlox<sup>®</sup> 4894
- Atsurf<sup>®</sup> 311 HF

*[Note: The composition of inert ingredients is often unknown to the registrant of the pesticide formulation. These ingredients are considered trade secret. CDPR maintains a confidential database that includes the chemical composition of inert ingredients. In this case, the two inerts were not in CDPR's database].*

**DAS response.** At DAS' request, Uniqema, the manufacturer of the Atlox<sup>®</sup> and Atsurf<sup>®</sup>, furnished CDPR with the chemical composition of these inerts in July, 2002.

6. **CDPR concern.** The registrant needs to provide final report for three-year, long-term soil accumulation study in progress in Washington.

*[Note: At the time the original registration package was submitted by Rohm & Haas, four soil dissipation studies were submitted. CDPR believed that the results of these studies indicated that Intrepid<sup>®</sup> could accumulate in soil and potentially leach to*

*groundwater. EPA registered the product with the statement, “This chemical has properties and characteristics associated with chemicals detected in ground water. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground water contamination.” CDPR was unwilling to register the product without the completion of a longer term soil accumulation study].*

**DAS response.** DAS completed the study in June of 2002 and furnished it to CDPR in July of 2002.

7. **CDPR concern.** The registrant needs to provide an acceptable storage stability study for RH-1518 in cow liver.

*[Note: This comment is related to an animal feeding study which Rohm & Haas submitted with the application. CDPR questioned the rate of decline of the RH-1518 metabolite and the variability of the analyses in the study and felt that the study was unacceptable].*

**DAS response.** DAS successfully rebutted CDPR’s contention and the study was accepted.

CDPR registered Intrepid® for cotton and pome fruits only in May of 2003, or approximately 32 months after the USEPA registration and the Rohm & Haas submission to California. It took DAS approximately 14 months to respond to CDPR’s May, 2001 denial of the Intrepid® registration. DAS representatives stated that about half of that delay, or about seven months, was the result of the purchase of Rohm & Haas by DAS. No new data was generated to overcome the CDPR denial. However, two studies, storage stability and soil accumulation, were completed and submitted in July of 2002. Another ten months elapsed before Intrepid® was registered.

In September of 2002, DAS amended the federal label to include stone fruit uses. DAS submitted an amendment to add stone fruit to the California label in September of 2003, after spending a year conducting efficacy trials required by California regulations. The stone fruit label was approved by CDPR in January of 2004.

Several additional crops were eventually added to the Intrepid® label. For the most part, the time between submittal of the amended labels and approval by CDPR ranged from two to five months. Delays were also associated with the conduct of efficacy trials for some of these crops.

The initial registration of this reduced risk, organophosphate replacement in California took thirty-two months. CDPR reviewers identified seven areas where they believed data was missing or inadequate. Overall, the issues concerning the limits of quantification, the one year storage stability study and the chemical composition of the inert ingredients, were not significant. DAS easily obtained the information CDPR needed or rebutted CDPR's assertions. The issue concerning the RH-1518 metabolite was also rebutted by DAS, but it represents a more fundamental problem with some of CDPR's reviews. In this case, the CDPR reviewer judged a study to be inadequate because it did not meet EPA Guidelines when, in fact, EPA reviewers accepted the study. In addition, since EPA, not CDPR, sets residue tolerances, there is really little reason for CDPR to review residue studies. CDPR no longer routinely requires residue data from registrants.

The final, and it appears controlling, delay in registration involved the environmental fate studies. DAS was able to rebut CDPR's determination that the anaerobic soil metabolism study was inadequate by submitting additional detail on the study. However, the results of the soil dissipation studies, taken together with the results of certain other environmental fate studies and the EPA-required groundwater precautionary statement on the label, raised seemingly legitimate concerns about potential leaching. DAS supplied additional information about the studies and rebutted CDPR's assertions, but it is likely that it was the results of the long term soil accumulation study that finally gave CDPR the information they needed to register the chemical.

The longest delay in registering this active ingredient was associated with the requirements of the Groundwater Protection Act of 1985. (Food and Agricultural Code Sections 13141-13152). According to CDPR reviewers, the results of studies submitted as required for registration under these code sections, indicated a potential for the active ingredient to leach to ground water. Results of a final, long term study convinced the reviewers that the chemical was not likely to leach to groundwater.

**Table 4-6: Use rates and costs for selected lepidopterous (worm) control products for Peaches in CA**

Trade Name	Chemical Name	Std. Use rate/A	Cost of Product/A
Intrepid <sup>®</sup> insect growth regulator (IGR)	mehoxyfenozide	12	21.09
Checkmate* pheromone	E-E 8,10-dodecadiene or isomer	200	67.50
Imidan <sup>®</sup> 70WP insecticide	phosmet	43	34.60
Asana <sup>®</sup> XL insecticide	esfenvalerate	8 oz	6.25
Sevin <sup>®</sup> 80S insecticide	carbaryl	3#	18.90

**Table 4-7: Use of new reduced risk insecticide product in Peaches in California.**

Intrepid <sup>®</sup> Use in CA Peaches	2004	2005
% Market Share	1	2
Acres Treated	4900	5821

Cost data for worm control products in peaches shows that reduced risk products such as pheromones can be much higher than conventional products (Tables 4-6 and 4-7). Use of pheromones and IGRs will likely require repeated applications and will be highly integrated into an overall management program. These products also require proper timing and placement; therefore adequate training of field personnel is required. While collective costs will likely be higher using Intrepid<sup>®</sup> and other reduced risk products, the benefits in terms of reduced potential impact on consumers, workers, and the environment are favorable. The availability of OP replacements is desired for reduced risk management of several Lepidoptera pests of peaches (see UC IPM Guidelines for Peaches in the Appendix). As new products such as Intrepid<sup>®</sup> are used more frequently by PCAs and growers, the success rate and confidence with product performance will likely increase.

### **An Example of an FQPA Impacted Commodity – Fresh Peaches**

Since the passage of FQPA, industry efforts in terms of pest management research have focused on helping growers to transition to reduced organophosphate use. Two years after the passage of FQPA, Consumers Union (1998) published a report in which they outlined what they considered to be the most critical commodities for OP use. They reported that use of OPs insecticides was high relative to other crops and that in 1995, over eighty percent of all peach acres were treated with and OP. While use of OP insecticides is lower than reported in eastern states of production, this class of chemistry has been extremely important to pest management in our state for many

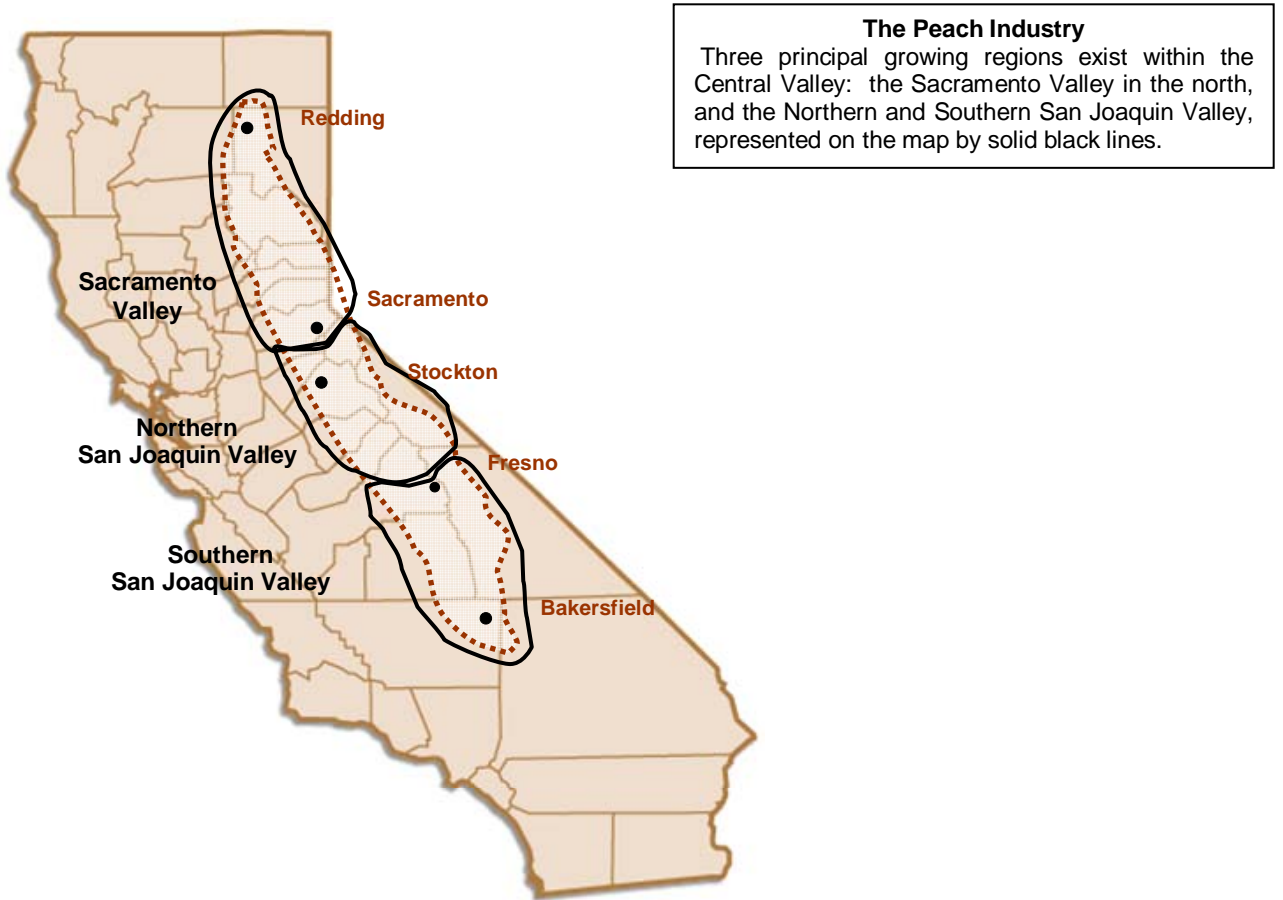
years. Pests driving OP use on peaches in California include peach twig borer, oriental fruit moth, omnivorous leaf roller and San Jose scale.

Peaches are an important specialty crop and they are grown in several states. The top three states in peach production are California, South Carolina and Georgia. California produces well over half of the peaches grown in the US; the total value of the peach crop was estimated to be \$246 million. Production per acre is superior to other regions of production in the US.

USDA-ERS reports that California produces about 90,000 acres of peaches as compared to other peach growing states such as South Carolina (16,000) and Georgia (15,000 acres). About one-third of the California crop is marketed fresh and the other two-thirds is used in the processing industry. It is important to note that pest management issues differ between fresh and processed varieties. While California's rate of production varies little, weather conditions affect production in other peach-growing states.

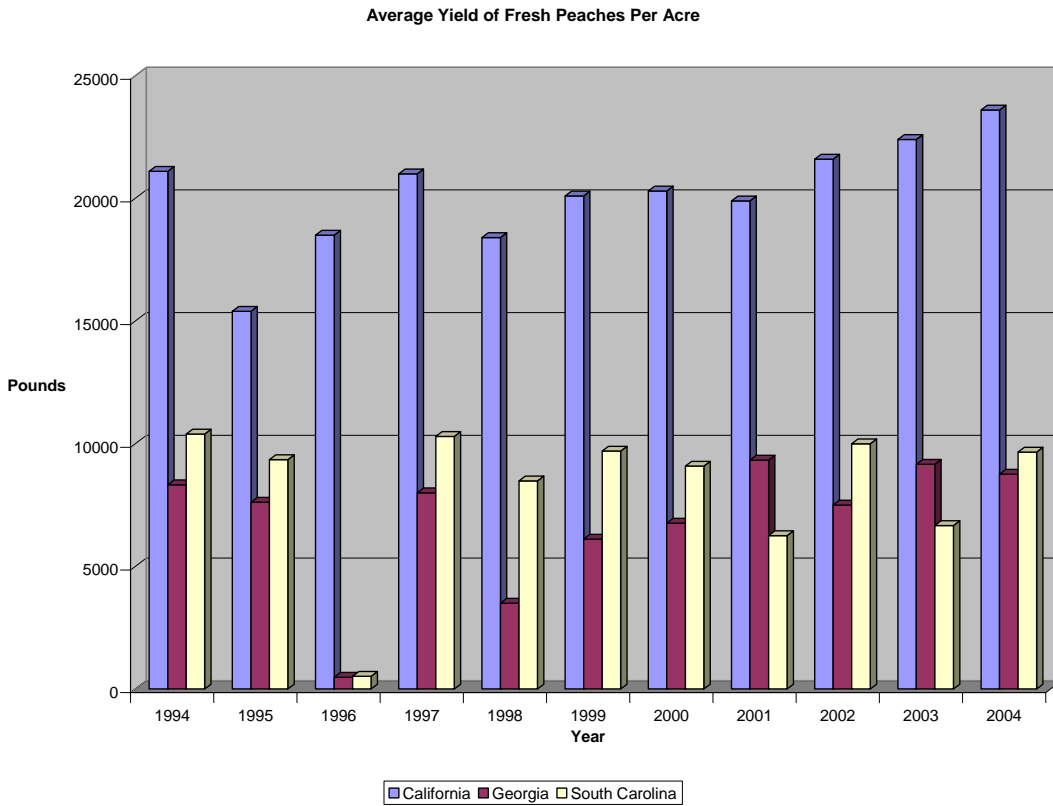
The main peach production areas in California are shown below in Figure 4-1. Peaches are a high input crop and there are numerous cultural and pest management activities required in order to produce a marketable crop. Seasonal profiles of peach crop development, cultural practices and pest management activities are in Appendix H.

**Figure 4-1: Peach Production Regions in California**

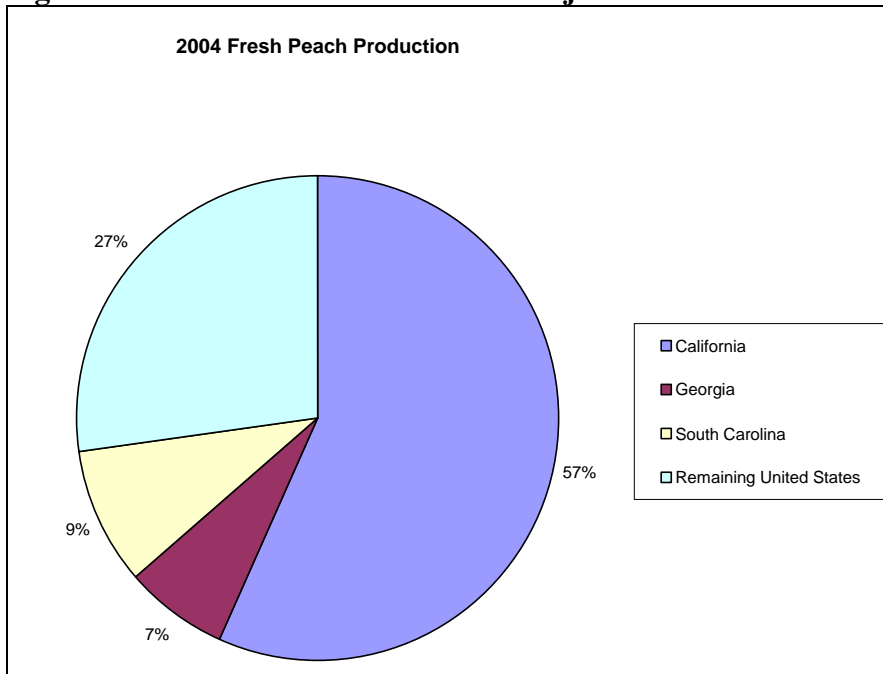


The following information (Figures 4-2 and 4-3) shows the average yields per acre and comparative statistics for peaches grown for the fresh market in California, Georgia, and South Carolina (USDA-NASS) and the relative importance of California in the production of this commodity. California is clearly the leader in terms of production per acre and overall acreage dedicated to this commodity.

**Figure 4-2: Fresh Peach Yield per Acre in California, Georgia, and South Carolina**



**Figure 4: Fresh Peach Production in Major Peach Production States**



There are several important pests of peaches in California (Table 4-8); for more detailed information on these and other pests of peaches, the reader is directed to the Crop Profile for California Peaches at website <http://pestdata.ncsu.edu/cropprofiles/docs/capeaches.html> (January 1999), and UC Publication 3389, *Integrated Pest Management for Stone Fruit*, 2002. In recent years, major shifts in insect problems in terms of species causing economic damage have been observed. This is in great part explained by the shift away from organophosphate insecticides to reduced risk materials that typically have a narrower spectrum of activity. Some pests which were formerly considered occasional or secondary pests are now of increasing importance in integrated pest management programs.

**Table 4-8: Important Pests of Fresh and Processed Peach Varieties in California**

	S. San Joaquin Valley	N. San Joaquin Valley	Sacramento Valley
Insects*	SJS, OFM, PTB, OLR, katydids, mites	SJS, OFM, PTB, OLR, mites	SJS, OFM, PTB, OBLR, mites

\* SJS = San Jose Scale, OFM = Oriental Fruit Moth, PTB = Peach Twig Borer  
 OLR = Omnivorous Leaf Roller, OBLR = Oblique-banded Leaf Roller

Pest management in peaches is a complex process which is ongoing throughout the year; pest importance varies according to whether the crop will be harvested for fresh or processed consumption (Table 4-9). For more detailed information on these and other pests of peaches, the reader is directed to the Crop Profile for California Peaches at website <http://pestdata.ncsu.edu/cropprofiles/docs/capeaches.html> (January 1999), and UC Publication 3389, *Integrated Pest Management for Stone Fruit*, 2002. As there is considerable peach acreage in California, the successful transition and adoption of OP alternatives could represent a significant reduction in use of these materials.

**Table 4-9: Pest Management Issues in Fresh Market vs. Processed Peach Varieties**

Pests	Fresh Peaches	Processing Peaches (“Clings”)
Worms	No worm damage tolerated	Minor issue; some cosmetic worm damage tolerated since the skin is removed during processing
Scales	Major issue	Minor issue; some cosmetic damage tolerated since the skin is removed during processing



In recent years, major shifts in insect problems in terms of species causing economic damage have been observed. This is in great part explained by the shift away from organophosphate insecticides to reduced risk materials that typically have a narrower spectrum of activity. Pests which were formerly considered occasional or secondary pests, such as katydids, oblique-banded leaf roller (OBLR), and others, are now of increasing importance in integrated pest management programs.

The pest spectrum driving OP and carbamate use on California peaches includes San Jose scale, peach twig borer, oriental fruit moth, katydids, and mites. Peach growers have a growing range of available and emerging alternatives (Table 4-10). The table below indicates the variety of pests and variety of pest-management alternatives which have been or are becoming more available.

**Table 10: Organophosphate Insecticides and Alternatives for PTB and OFM Control in Peaches**

Pest	Organophosphates	Alternatives to OPs	Reduced Risk Alternatives	BioBased Alternatives
Peach Twig Borer (PTB)	methyl parathion diazinon chlorpyrifos phosmet methidathion	esfenvalerate permethrin endosulfan	fenoxycarb tebufenozide methoxyfenozide	<i>Bt</i> PTB Pheromone spinosad Narrow range oil
Oriental Fruit Moth (OFM)	azinphos-methyl diazinon phosmet	methomyl esfenvalerate	DPX-MP062+ fenoxycarb methoxyfenozide	OFM Pheromone spinosad

Pest management issues, especially in the post-FQPA era, continue to present challenges to specialty crop farmers. Representatives from chemical companies report that their organizations are recognizing the needs of specialty crop markets more than in the past where their efforts focused on major crops. Success towards registration of new chemistries, especially at the federal level, has increased in the last several years. CDPR continues to require additional data,

and this situation appears to be improving dependent upon the specific product, even if at a slower pace than what growers would prefer.

Newer products tend to be more expensive and are more difficult to use than previously used broad spectrum products. These factors strongly point to the increased role of university research and cooperative personnel to be involved with field research and demonstration.

Growers and PCAs working with specialty crops have shown that reduced risk technologies can work and that use of products classified in this category is increasing rapidly; over five million acres were treated with reduced risk products in 2003 (see “Use Trends of Reduced Risk Products in Appendix).

## **Summary**

The present study attempted to evaluate three cases of delayed registrations in California. There is clear evidence that registrations were held up in the regulatory process for each of these. Each product had a unique registration timeline. From the registrants’ perspective, many of these could have been avoided, especially in cases where US EPA had determined the product had a reduced risk profile long before these materials had entered into the California review process.

There will continue to be needs for products with reduced risk profiles and/or products for use in resistance management programs. Product availability and availability of efficacious materials will help to reduce overall pesticide loads in the environment. CDPR should strive to meet the needs of all stakeholders – growers, workers, and consumers – in registering safe and effective pest management tools. Recent statutory changes in efficacy requirements (i.e., reduced requirement for California efficacy data) will hopefully allow additional staff to review aspects of product safety.

The cases presented, for the most part, do not appear to represent significant economic costs for growers. In fact, the costs of new products are generally higher than the older technology. Investments in the infrastructure of R&D and technology through registrants, the Land Grant

University and cooperative extension system, will need to be made to deliver safer, reduced risk products in a timelier manner to growers. Investments will be required to help teach growers and PCAs how to use products which are more narrow in spectrum and which are more difficult to use in terms of application technology and timing for effective control of insects, weeds, diseases and other pests.

There will be continued challenges ahead for entities wanting to pursue commercial opportunities for specialty crop agriculture. Delays experienced with the California system should be recognized and addressed to deliver safe, new products within a reasonable time frame.

Grower groups need to be diligent in identifying key product needs and work with US EPA, CDPR, and IR-4 to hasten the registration process as much as possible. In many cases, the commodity groups themselves are lacking in identifying product candidates and developing solid efficacy and phytotoxicity profiles for specific products.

As a result of FQPA, there are some advantages for companies pursuing specialty crop registrations in terms of patent life, but many minor crop uses are not being supported on product labeling because of excessive costs to develop supportive data packages and other factors that impact a product's regulatory status. Product availability will continue to be a concern and a challenge for specialty crop farmers in California and the US. The IR-4 system will continue to be an incredibly valuable tool.

CDPR's goal is to register pesticides within sixty days of receiving the registration application. According to reports and testimony provided by the Western Plant Health Association in 2005, CDPR has a considerable registration backlog (>500) pesticides that have exceeded the sixty-day window. CDPR has twenty staff positions dedicated to registering pesticides. CDPR estimates that about fifty percent of its registration staff's time is spent dealing with issues related to letters of authorization and efficacy data reviews. A recent law eliminated efficacy data requirements is hoped to ease staff review time for reviews, especially those personnel available to review environmental and worker safety data.

Reductions in use of many broad spectrum pesticides since FQPA has passed shows that growers will adopt reduced risk practices as soon as appropriate products and training have been made available for them to comfortably transition to new practices.

## **Recommendations**

Based on the information developed in this report, coupled with an understanding of the challenges that lie ahead for specialty crop agriculture in California, the following recommendations are made:

- ❖ *Commodities should identify critical pest management needs and obtain or provide funding for research programs, especially those that are focused on assessing efficacy and use of reduced risk products; there are several ongoing grant programs through EPA and USDA.*
- ❖ *Commodities should effectively communicate and coordinate with US EPA and Western Region IR-4 to expedite field research and registration packages.*
- ❖ *Registrants continue to be diligent and cooperative in providing follow-up information to CDPR.*
- ❖ *Registrants should clearly communicate with commodity groups on unacceptable delays with the California Department of Pesticide Regulation.*
- ❖ *California Department of Pesticide Regulation should be transparent with registrants and commodity organizations on controversial issues related to evaluation of crop protection chemicals.*
- ❖ *California Department of Pesticide Regulation should be proactive in efforts to register crop protection chemicals in accordance with statutory requirements and in a timely manner, especially those that have been deemed “reduced risk” by US-EPA.*

## **Chapter 5: The Impact of California's Changing Environmental Regulations on Timber Harvesting Costs<sup>3</sup>**

### **Introduction to Environmental Regulations And Timber Harvesting Costs In California**

One of the food and fiber production sectors that has been the focus of considerable regulatory pressure is the forest products (timber) industry. The process of harvesting timber and transporting it to wood processing facilities unquestionably has the potential for significant environmental impacts. California's laws and regulations dealing with timber harvesting have been widely acknowledged as some of the most intense in the U.S. and even the world (Yee 2003, Dicus and Delfino 2003, Morgan, et al. 2004, Thompson and Dicus 2004). Since its passage in 1973, the California Forest Practices Act (CFPA) which governs the planning and conduct of harvesting operations, has expanded and intensified in response to changing federal regulations, court rulings and pressure from public factions.

This component of the project represents Phase 3 of a longer-term research initiative at Cal Poly to characterize the economic and ecological effects of environmental and forest practice regulations in California. The purpose of Phase 3 is to describe the impacts on timber harvesting (a.k.a. logging) costs. Phase 1 compared the State's CFPA to certification programs administered by international organizations to promote sustainable land practices (Dicus and Delfino 2003). Phase 2, just completed, analyzed the effects of environmental regulations on timber harvest planning costs in the forest products industry (Thompson and Dicus 2005).

### **Trends in the Forest Products Industry**

Before addressing the influence of environmental regulations on logging costs, it may be valuable to place logging activity in the larger context of the supply chain from the forest to finished wood products. Essentially, there exist three markets involved in transforming standing timber into retail wood products. These markets are linked whereby the demand for the natural resource is derived from final consumer demands. The supply chain begins with the retail markets for wood products which are closely linked to wholesale markets wherein companies like Home Depot and Loews are some of the more dominant purchasers. The supply-side of the wholesale market is comprised of numerous domestic and foreign wood products manufacturers

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<sup>3</sup> This chapter was developed by Drs. Richard P. Thompson and Christopher Dicus.

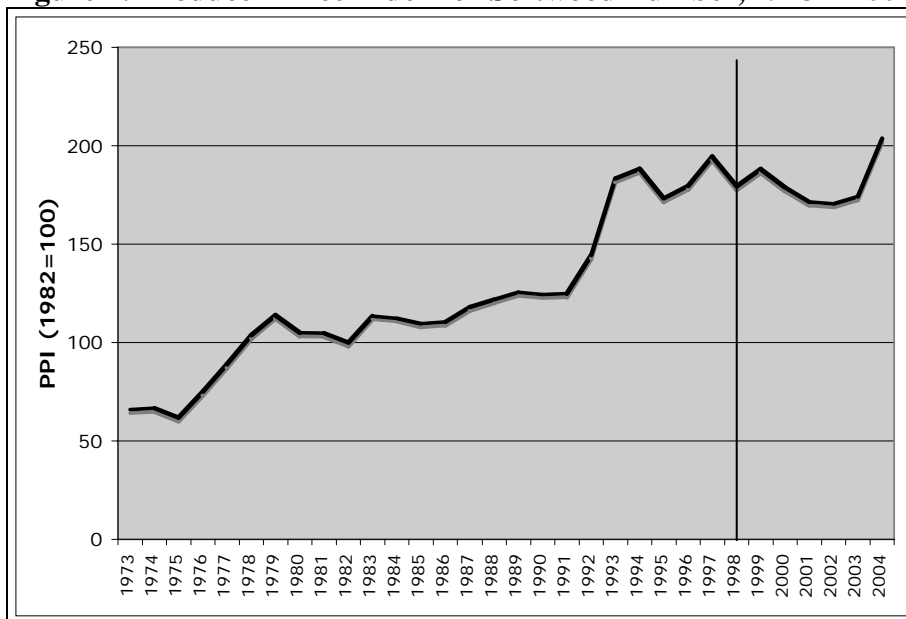
-- lumber and paper mills and a whole host of new composite wood materials manufacturing facilities. The larger of these firms will typically have their own timberlands as a source of raw material but most will have to purchase raw material from other “firms.”

Considerable variation in timber resource markets exists around the nation and the world. Standing timber can either be sold directly to primary wood products manufacturers or to other firms in the form of logs. In some parts of the United States, mainly the West, relatively efficient intermediate markets for logs still exist. The following sections briefly describe these three basic markets giving particular attention to trends in the West, Oregon and California.

### ***Finished Wood Product Market***

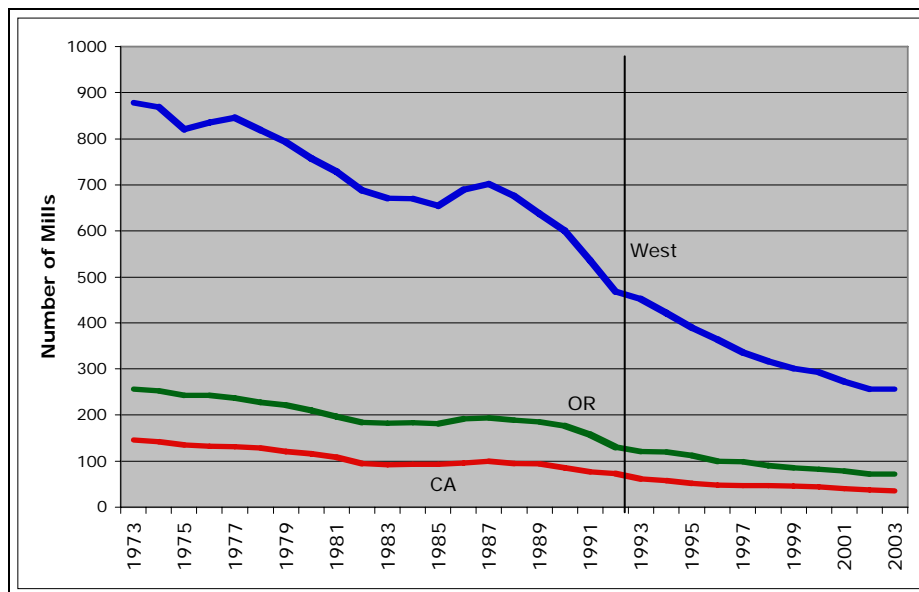
The market for finished wood products is comprised of wholesale and retail markets as with most goods. Retail wood markets, primarily for new home construction, are the ultimately “driver” for all markets back to the resource itself but the wholesale or producer level is where trends are most easily tracked. Figure 5-1 illustrates the trend since 1973 in BLS’s Softwood Lumber Producer Price Index (Bureau of Labor Statistics 2004). It seems that there was a significant price jump after about 1991. A number of forces led to this relatively sudden change but perhaps the most significant was the housing boom of that time period (Tuchman et al. 1996).

**Figure 1: Producer Price Index for Softwood Lumber, 1973 – 2004**

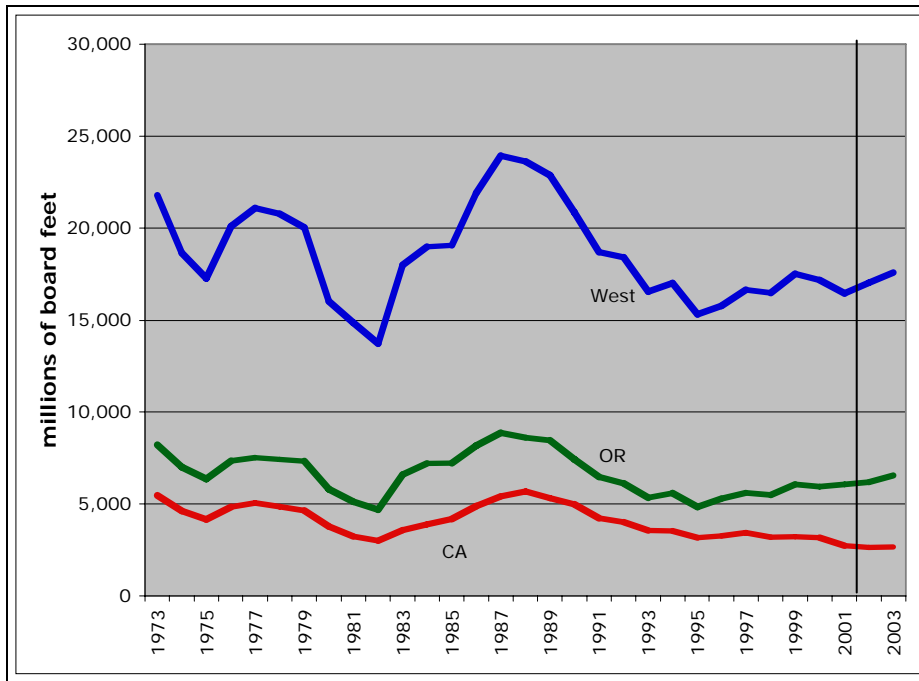


In the Western U.S., other major events in early 1990s combined with the housing boom to impact the wood industry – big increases in Canadian imports and “listing” the Northern Spotted Owl (NSO) as threatened under the federal law. Almost immediately, listing the NSO closed large portions of federal forestland in Northern California, Oregon and Washington as a source of timber. Long before this event, the industry in these states had been restructuring away from its historic reliance on large timber. Modern mills are typified by larger volumes of smaller log sizes and, as a result, are more capital-intensive. Figures 5-2a and 5-2b illustrate this structural change. After the loss of the federal timber source, some of the industry was able to substitute private timber but not so in many areas. Evidence of this net loss can be seen in Figure 5-2a where a sudden drop in the number of mills occurred in the early 1990s. Nevertheless softwood production in the West and Oregon began to gradually increase pulled-up by the significant economic growth starting in the mid-1990s. However, California seemed unable to participate in this growth and began losing market share around 1995 – declining from twenty-five percent of Western softwood production in 1973 to less than fifteen percent today (see Figure 5-2b).

**Figure 5-2a: Operating Sawmills, 1973 – 2003**



**Figure 5-2b: Softwood Production, 1973-2003**



Source: Western Wood Products Association (2004)

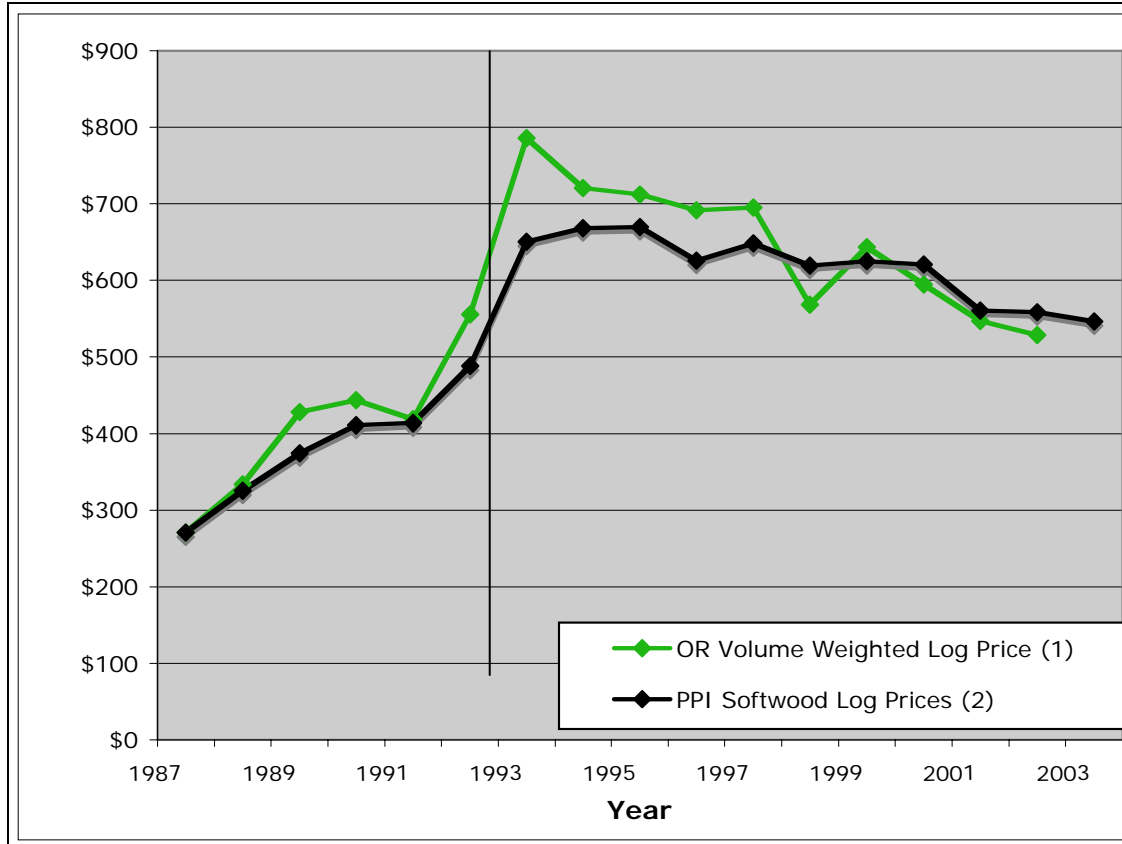
### ***Log Market***

Due to a host of landownership pattern and industrial structure conditions, Oregon and Washington still have a fairly active log market. No publicly reported data was available for log prices in California.

Figure 5-3 displays log price trends for Oregon and the national “average” for softwood logs using the PPI. As predicted from the theory of derived demand, log price trends (see Figure 5-3) track very closely to wholesale lumber prices (Figure 5-1). Both log price series correlate well showing a rapid increase in the late 1980s until the peak in 1993 corresponding with lumber price trends (Figure 5-1). However, log prices declined around 1993 while lumber prices continued a modest increase. Again, a number of explanations could be offered to account for this divergence but the most likely include (1) the increase in Canadian lumber in the early 1990s, (2) declining log exports to Japan in the mid to late 1990s coupled with (3) increasing Canadian log imports (Perez-Garcia and Barr 2005).



**Figure 3: Volume-weighted Log Prices in Oregon vs. PPI Softwood Log Price Index, 1987 - 2003.**



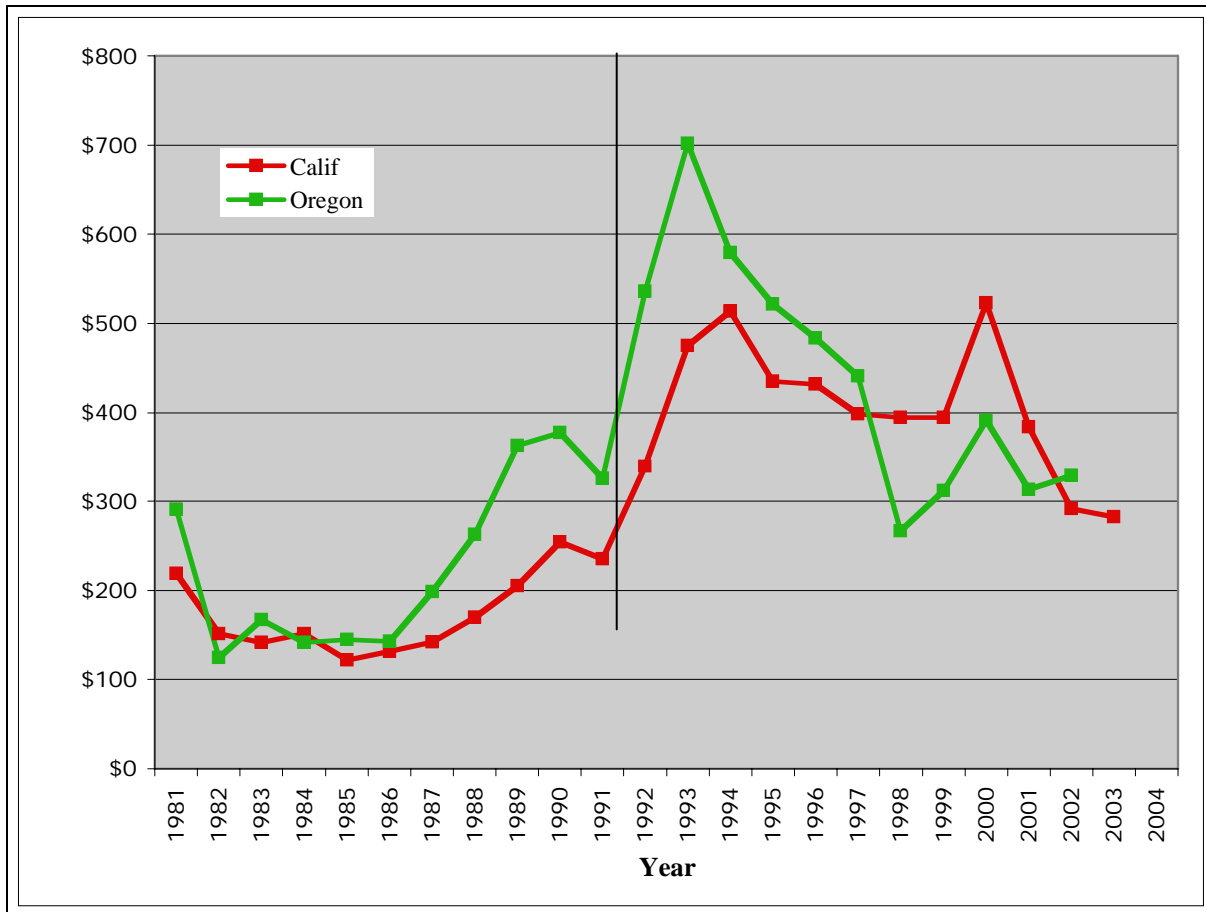
1. Annual average log prices - quarterly Doug-fir and Hemlock prices weighted by volume from ODF Region 1 (Willamette). Doug-fir and Hemlock species combined represent around 85% of log volume processed. Prices were for log grade 2S, the most common grade of these two species. Prices are deflated using the broad PPI. Source: Oregon Dept. of Forestry (2005).
2. Producer Price Index for softwood logs, scaled to start at the volume-weighted Oregon log price in 1987.

### ***Timber Market***

The market for timber is derived from either the log market or, more often, directly from wholesale finished wood markets. The prices paid for standing timber are economic rents to landowners, called “stumpage” in the industry. Here again, as expected, the timber market tracks closely to upstream markets beginning a rapid increase in 1991 and peaking around 1993 (see Figure 5-4). In this figure, the difference in price trends between Oregon and California can be seen where the run-up in prices up to 1993 was more pronounced in Oregon and fell-off more rapidly than in California. The still sizeable California redwood industry that is less related to

home construction than is Douglas-fir, which dominates Oregon's industry, is perhaps one explanation for these differences.

**Figure 4: Average Annual Timber Prices on Private Forestland in Oregon and California, 1981 – 2003.**



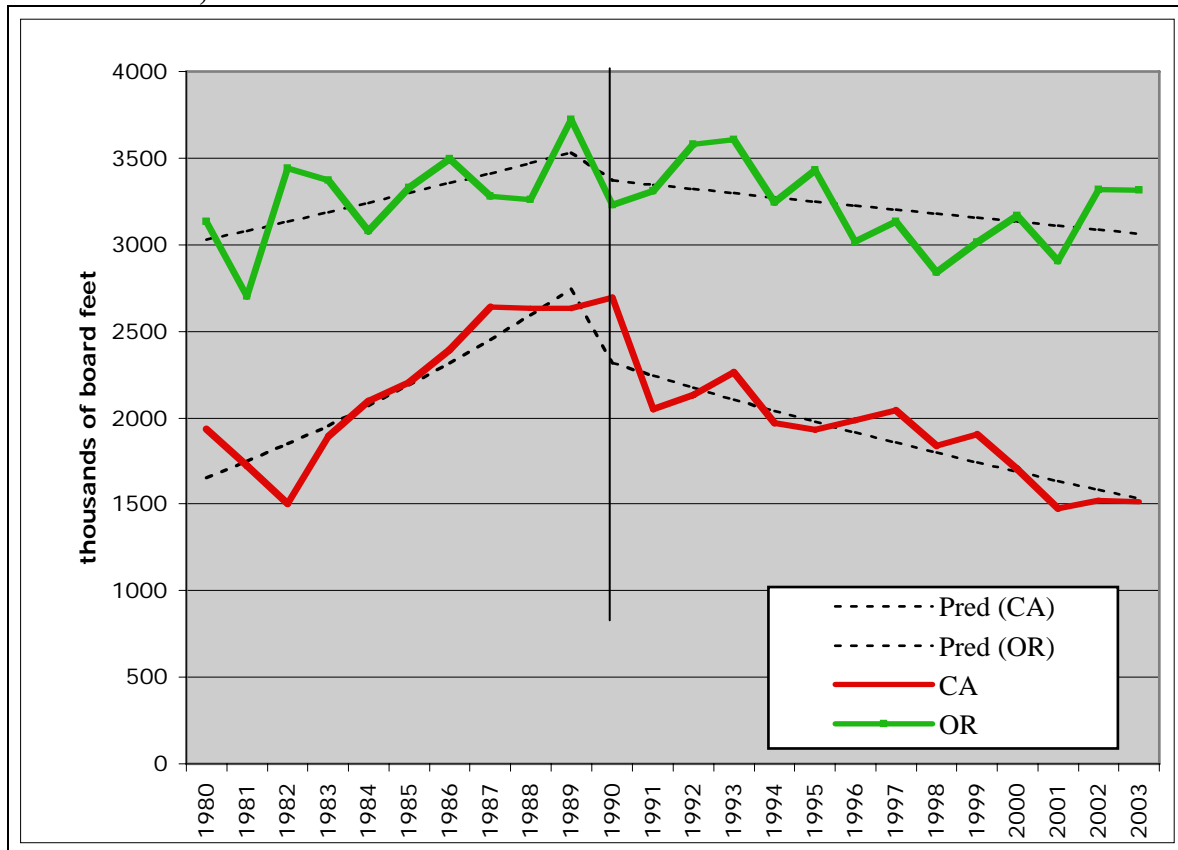
Sources: California Board of Equalization (2005) and Corgan (2005)

Figure 5-5 presents annual harvest volumes of non-federal timber in California and Oregon since 1980. Again, as predicted, the volume of timber harvested shows responsiveness to price. However, harvests appeared to have peaked considerably before wholesale and log prices peaked. Although explaining why production did not continue to increase in response to price is not necessarily germane to this study, there is some relevance depending on the true cause. Unsustainably high harvest rates on private lands in the Pacific Northwest (including California) from the 1960s through the 1980s were known and shortages were predicted beginning in the 1990s (Tuchman et al. 1996). The inability of the private sector to provide substitute supplies,

when the federal forestlands were essentially closed to logging starting in 1989, has also been studied with no clear explanation (Johnson 2005).

Statistical analysis of these timber harvest series reveals that California’s rate was increasing faster than Oregon’s until 1990, after which it declined more rapidly. Unlike Oregon, California’s harvest rate appears to be more “elastic.” What role forest practice regulations played in these declining harvests especially in California is not clear. However, the significant number of mill closures in the Pacific Northwest due to loss of federal timber sources starting in 1989 would certainly reduce demand for timber in aggregate.

**Figure 5: Annual Timber Harvest Volumes and Regressed non-Federal Volumes in Oregon and California, 1980 – 2003**



Sources: California Board of Equalization (2005) and Oregon Department of Forestry (2005)

## **History of the California Forest Practices Act**

A brief history of the evolution of California's FPA is needed to justify questioning the operational cost impacts of California's forest practice regulations. The following excerpts this history from the publication by Thompson and Dicus (2004).

The dominant forces affecting a state's environmental law and regulations are federal legislation, court rulings, and executive branch actions in response to political pressure. Nevertheless, states possess considerable latitude and discretion in their efforts to obey federal law while meeting the demands of its citizens for healthy economies and environments. cursory observation shows that regulation of forest practices varies considerably by state. On one end of the spectrum, many states use voluntary laws that promote best management practices. At the other extreme, some states rely upon comprehensive acts characterized by mandatory, process-oriented regulations. States with comprehensive FPAs include Washington, Alaska and, of course, California. Those using voluntary or outcome-based approaches comprise primarily the Southern states and Oregon in the West.

Generally, California has led the United States in measures to protect environmental quality particularly so for its forests. California's Board of Forestry, established in 1885, was one of the nation's earliest governmental bodies formed to protect its private forestlands. Today, the California Board of Forestry and Fire Protection (CBOF) are responsible for administering the CFPA and promulgating the Act's rules and regulations.

In 1945, California passed its first forest practices act; however, it was found to be unconstitutional in 1970 on the grounds that the industry was essentially self-regulated (*Bayside Timber v. San Mateo Co.*, Superior Court, No 148093). The remedy required new legislation. In September 1973, the Z'Berg-Nejedly Forest Practices Act (AB 227) was signed into law by Governor Reagan. The purpose of this law was to ensure “*maximum sustained production of high quality wood products . . . while giving consideration to measures proposed to reduce or avoid significant adverse impacts . . . on the land . . .*” (Title 14, Chp. 4, Sub 2, Article 1, Part 897).

A year earlier, California enacted the Professional Foresters Law mandating that only licensed professional foresters were allowed to manipulate forest vegetation on state and private lands. Additionally, the law mandated procedures to license professional foresters (Registered Professional Foresters, RPFs). As with all state licensure, civil and criminal penalties are available for failure to adhere to the licensure standards and requirements. The critical nexus with this law and the 1973 law was that only a RPF is permitted to submit a Timber Harvest Plan (THP).

Enactment of the 1973 CFPA did not include any emergency provisions and therefore interim logging rules applied until a newly appointed CBOF could promulgate new regulations (Arvola 1976). In November 1974, the new CFPA rules became effective. In the intervening year, 2500 harvest plans were filed with the California Department of Forestry and Fire Protection (CDF), the agency charged with enforcing the CFPA rules and regulations (Arvola 1976).

The new CFPA had barely been in force when new litigation imposed another major overhaul of the law. The Natural Resources Defense Council, a non-governmental organization staffed primarily by lawyers, filed suit against three timber companies operating in the basin surrounding the newly formed Redwood National Park in Humboldt County, claiming that timber operations represented a “project” under the California Environmental Quality Act (CEQA) which was passed the same year (*NRDC v. Arcata Redwood Co., Humboldt Co. Court, No. 54212*). In January 1975, the court ruled in the NRDC’s favor, forcing emergency action by Governor Brown to bring the CFPA into conformity with CEQA.

Confusion reigned for nearly six months until new forest practice rules and regulations took effect. It now seems appropriate to assign 1976 as the year when this revised Timber Harvest Plan (THP) formed the basis for the current provision. All subsequent policy changes essentially represent amendments to the 1976 status.

After 1976, the THP became the functional equivalent to an Environmental Impact Report (EIR) under the CEQA, continuing to incorporate all relevant federal environmental law. Some of the key features added to the THP centered on the CEQA’s public disclosure requirements such as

feasibility analysis, public review, and appeals procedures. Analysis of cumulative effects from logging was another requirement imposed by CEQA. The requirement to provide public notice of a THP was added in 1979 in response to a state Supreme Court ruling in *Horn v. County of Ventura*.

Legal and regulatory actions seemed to remain fairly steady until the early 1990s when an array of environmental issues arose primarily from problems unique to California but with some impetus from federal legal and regulatory actions. A number of voter initiatives were proposed to dramatically alter forest practices on California's private forestlands but none passed. Nevertheless, the political momentum culminating in the Sierra Accord in 1991 (and the related Grand Accord in 1992) combined with court rulings forced CBOF to issue a litany of emergency rules. Adopted almost *en masse* the following year (1993), these rules required the RPF to analyze and propose protection measures for resource values such as old growth, watershed cumulative impacts, domestic water sources, sustained yield (Delfino 2004). More details on these and other regulatory actions are provided in Thompson and Dicus (2004) and summarized in Appendix I-1.

Perhaps the most significant among these new regulations resulted from the listing of the Northern Spotted Owl as "threatened" under the federal Endangered Species Act (ESA) in 1989. Though most of the impact of this listing was directed at the management of federal lands in California, the "take" provisions under ESA caused major changes to THP preparation and logging practices on private lands. Contemporaneous with protection regulations for new listed species and sub-species was a host of other species that were declared "threatened" under both ESA and California's ESA (CCR 895.1 and 959.10). The Coast District (essentially the coastal counties above the San Francisco Bay area, a.k.a. the redwood region) was especially hard hit by these new regulations. Not only is this region part of the range of the NSO but also the newly listed Marbled Murrelet that biologists assert need large, old trees for nesting habitat.

Watershed protection was also central to the significant changes and expansion of regulations in the early 1990s. One highly significant change was the loss of the general waiver for non-point source pollution from silvicultural operations (Section 208 of the Clean Water Act) in 1993.

Afterward, each THP had to include an individualized stream monitoring plan to address concerns over non-point sources of pollution during harvesting operations. As permanent roads and bridges were considered a major source of stream sedimentation, a new array of rules for post-harvest road maintenance took effect (see Appendix I-1).

These numerous new amendments and expanded review from multiple agencies transformed the original THP process into a complex, time-consuming ordeal that rivals some of the most complex Environmental Impact Reports. The result is today the average THP costs over 30,000 dollars to prepare and gain approval (Thompson and Dicus 2004). Applying the predictive model to the nearly 550 THPs approved back in 2003, almost **\$12 million** was spent by forestland owners to be able to sell their timber.

### **Problem Statement**

The study by Thompson and Dicus (2004) demonstrated that the growth in the CFPA's regulatory requirements significantly increased the cost of planning and conducting logging operations. In the short-run, these costs are entirely born by the landowner as they attempt to sell their timber. In the long-run, the increased cost to timber sellers may compel some (primarily smaller ownerships) to switch to other land uses thus reducing supply and raising timber prices (mill raw material costs). Table 5-1 provides evidence that forest products industry leaders view these environmental and forest practice regulations as the most important issue affecting their industry today.

Even though the CFPA has significantly raised the cost of preparing timber for sale in California, the question remains whether these regulations have increased operational costs. Rents (a.k.a. "stumpage") received by forestland owners for selling their standing timber reflect demand derived from markets upstream (log or finished wood product markets). Because wholesale and, even more so, retail wood product markets are international in scope, the ability to push increased raw material and processing costs onto the consumer is not possible without market intervention designed to differentiate California produced wood products. Therefore, any increases in processing costs would be passed down to the timber owner in the form of reduced rents, creating additional incentives to convert their forestland to "higher and better" uses.

**Table 5-1: Issues important to California's Forest Products Industry Executives, Last 10 Years**

Rank	Importance of issues over the last 10 years	Very un-important -3	Mostly un-important -2	Slightly un-important -1	Neutral	Slightly Important 1	Mostly important 2	Very important 3
<i>Percent</i>								
1	California regulations	3	--	9	--	--	6	81
2	Market Conditions	3	--	6	6	13	22	50
3	Timber availability	13	6	3	--	3	9	66
4	Federal regulations	3	6	3	16	16	25	31
5	Harvesting/milling technology	3	6	9	19	31	19	13
6	Skilled labor availability	9	--	16	22	25	12	16

Source: Morgan, et al. 2004.

### Objectives

Our hypothesis is that California's rapidly changing and intensifying environmental and forest practice regulations have increased timber harvesting costs. The objectives of Phase 3 are to

1. characterize the trend in loggings costs;
2. determine if any significant differences exist in logging costs between California operations and those in states where regulatory requirements are different;
3. determine whether changing environmental and forest practice regulations in California have increased logging costs.

### Method

Since this study relies upon proprietary information held by firms in the private sector, the methodology must incorporate provisions for protecting confidential information from competitors, avoiding the potential for providing means for collusion, while still ensuring scientifically valid information. Thus no privately-sourced information will be provided in this report in a manner that can relate specific information with any particular firm.

To achieve objective one, two tasks were required. First, forest products firms that possessed lands in California and other states, including licensed timber operators (LTOs) and firms that manage non-industrial private forestland, were contacted regarding the availability of data on



past and current logging costs. Second, annual logging cost data were collected from cooperating firms using standardized operational conditions to provide trend consistency.

To achieve objective two and three more tasks were defined. First, forest practice regulations of neighboring states were considered for their contrast to California's. Once the state was selected, forest products firms that have operations in both California and the chosen state were contacted. Third, cost data were collected from cooperating firms on paired logging operations between California and another state – operations that were similar in all respects except the state in which they occurred.

To achieve finish objective three, data were analyzed to identify any relationship that may exist between logging costs and environmental and forest practice regulatory requirements.

## **Results**

Oregon was selected as the state with which to compare to California in the effect of environmental regulations on logging costs. The primary reasons for selecting Oregon were:

- at least six forest products firms have lands and operations in both states;
- it is a neighboring state with similar forest types and markets;
- both have a long history commercial timber production;
- in the early 1970s, the two states took a different approach to “regulating” forest practices.

These conditions make Oregon an ideal state to compare to California.

The list of forest products and logging firms in California was screened for those who possessed lands in both California and Oregon. The few that met this condition were contacted to request data on logging costs. There were a variety of reasons for not responding, record-keeping practices and changing operations were common but confidentiality concerns also contributed. Only two were able to provide data – Timber Products Company (headquarters in Springfield, OR) and Green Diamond Resource Company (headquarters in Seattle, WA). Information that stems from their data will be presented accurately but in a manner that protects their proprietary rights.

## **Comparing California and Oregon Laws**

Both California and Oregon have numerous similarities in their forest resources. Both states have highly productive timberlands (forestland used for commercial timber production) and long histories of forest utilization. Private ownership of timberland is similar – thirty-nine percent in Oregon and forty-two percent in California (ODF 2005, Forest Resource Assessment Project 2003). These two states also share a similar history in forest policy until the 1970s. A summary of key events in their histories can be reviewed for California (Thompson & Dicus 2004) and Oregon (Oregon Department of Forestry 2005). A comprehensive history of the events leading to changes in the California Forest Practice Act (CFPA) Rules can be found in Arvola (1976), Martin (1989), and Delfino (2004).

Oregon's Forest Practice Act (OFPA) was signed into law in 1971 and was quickly followed by California with the passage of the 1973 Z'berg-Nejedly CFPA. Both originally focused the traditional issues surrounding logging operations such as silvicultural systems, reforestation, logging design, and road construction. Subsequently, both addressed a wide range of additional rules dealing with the protection of water, wildlife, and soil resources. However, the CFPA after 1976 represents a major divergence in approaches, scope, and specificity of rules from Oregon's current system. In general, California developed a highly process-oriented approach and agency approval of pre-harvest plans, harvest and post-harvest operations, while Oregon allows considerable latitude in management practices with strict penalties for violating environmental standards. Indeed, ODF cannot even approve or deny a plan for any specific forestry operation (Oregon Laws 2003 c.740 §13) but can impose civil or criminal penalties if there is damage to natural resources as defined in the OFPA rules.

### ***Professional Forester Licensure***

Thirteen states currently have registration/licensing boards for foresters. California was one of the earliest; Oregon does not have one. Oregon defines a "professional forester" as anyone holding a B.S. degree from an accredited forestry program. In contrast, California established strict requirements for professionals who manage its non-federal forestlands. Beginning with the 1971 Professional Foresters Law, California created licensure for professional foresters in order to practice. The standards for licensure (Registered Professional Forester (RPF)) are extremely

high. Seven years of professional experience, working under the supervision of an RPF, and passing a rigorous day-long written examination are required to receive the RPF license. A B.S. degree from an accredited forestry program substitutes for four years of experience. As described in the History section, only an RPF can submit a THP. Furthermore, all CDF Forest Practices Inspectors must also be RPFs.

### ***Governing Bodies***

Both states have agencies that are tasked to develop forest practice rules. The seven-member Oregon Board of Forestry (OBOF) is appointed by the Governor and confirmed by the state Senate. No more than three members may receive any significant portion of their income from the forest products industry. At least one member must reside in each of the three major ODF administrative regions: east, south and northwest. The term of office is four years and no member may serve more than two consecutive full terms. The State Forester serves as secretary to the OBOF. The OBOF also must appoint regional nine-member forest practice committees -- one for each of the seven defined geographical regions in the state. These committees recommend specific rules to the OBOF relating to their geographic region. Finally, the Oregon State Forester and Oregon Department of Forestry (ODF) also advise the OBOF on rule formulation. Other than conflicts with existing laws, recommendations to the OBOF by all groups are non-binding

The ODF has authority to adopt and enforce specific forest practice rules in that state (ORS 527.630) but must consult with other state agencies, including the Department of Environmental Quality, Department of Geology and Mineral Industries, State Department of Fish and Wildlife, State Parks and Recreation Department, the Columbia River Gorge Commission, State Land Board and the Department of State Lands, Federal Department of Human Services, the Natural Heritage Advisory Council, the Water Resources Department, and the State Department of Agriculture (ORS 527.710).

The California Board of Forestry (CBOF) has 9 members appointed by the Governor -- three representatives from the forest products industry, one from the range/livestock industry, and five from the general public. The CBOF is charged with adopting new forest practice rules and

regulations to “assure the continuous growing and harvesting of commercial forest tree species and to protect the soil, air, fish and wildlife, and water resources, including, but not limited to, streams lakes and estuaries” (PRC 4551). The CBOF has four standing statewide committees to develop regulations for specific concerns -- Policy and Management, Roads and Watersheds, Forest Practices, and Resource Protection committees. Additionally, the CBOF can appoint other *ad hoc* advisory committees to advise them on specific issues of concern.

When adopting or revising forest practice rules, the CBOF must “consult with, and carefully evaluate the recommendations of, the department, the district technical advisory committees, concerned federal, state, and local agencies, educational institutions, civic and public interest organizations, and private organizations and individuals” (PRC 4553). The CBOF is also required by CEQA to consider public input in its deliberations in promulgating regulations (PRC 4554).

### ***Regional and County Rules***

Because of the considerable variation in ecosystems, both states allow for region-specific rules and standards in their forest practice rules. Oregon divides itself in to 3 broad regions including the Eastern, Northwest, and Southwest Oregon Regions (OAR 629-605-0160) for individual rules concerning roads and some timber harvesting practices. Further, rules for vegetation retention along streams (OAR 629-635-640) vary among seven different regions for which the climate, geomorphology, and vegetation are similar (OAR 629-635-0220).

Differences also exist between the states in the ability for individual counties to regulate forestry practices. Counties in Oregon may prohibit, but in no other manner regulate, forest practices on forestlands (ORS 527.722(4)). In California, however, many counties (four in Coast District and one each in Northern and Southern Districts) have added additional forest practice rules that are much more stringent than District rules.

California is also divided into three large regions including the Coast, Northern, and Southern Forest Districts. Some rules are not applicable in all three of the designated Forest Districts, and some variation exists within Districts. Further, there are two Subdistricts each with additional

rules. The first is the High Use Subdistrict, comprising ten coastal counties in the Southern District and portions of two counties in the Northern District that are within the authority of the Tahoe Regional Planning Agency. The second is the Southern Subdistrict of the Coast District, comprises 5 coastal counties around the San Francisco Bay area.

### ***Regulation and Rules***

The extent of planning, time/cost involved, and agency approvals seems to differ dramatically between California and Oregon. These differences are best described as a process-based vs. results-based philosophies of California and Oregon, respectively. The following subsections attempt to convey these differences.

#### ***Pre-harvest Requirements***

As mentioned above, the CDF administers the THP approval process (approval is underscored to emphasize that multiple agencies must approve the plan, either legally or pragmatically). Until recently, this process appeared to the landowner proposing the timber sale as a “one-stop shopping” system whereby CDF had final authority over approval after taking input from other agencies and the public. However, the California Water Quality Control Board through its regional was given final approval authority in 2003. In the same year, Oregon removed essentially all approval authorities from state agencies as a result of a voter initiative. Furthermore, serious objections from California Fish and Game or federal agents can represent *de facto* approval authority. Appendix I-2 summarizes the sequence of requirements and actions between the RPF, representing the landowner, and CDF and other agencies.

The ODF is charged with administering Oregon’s forest practice rules (OFPR) on behalf of the State Forester (ORS 527.736). To conduct forestry activities on Oregon private lands, landowners must submit a Notification of Operation (Appendix I-3) to the ODF at least fifteen days prior to starting operations (OAR 629-605-0150). This Notification is required for a range of timberland management activities (OAR 629-605-0140). Each Notification must include a map and aerial photograph of the site as well as pertinent information that might trigger further scrutiny by ODF. Such information includes distance from different classes of water bodies,

whether the operation is within the critical habitat of specific wildlife species, per the federal Endangered Species Act, or near archaeological sites.

ODF may elect to take no further action if the operation appears to have little risk of damaging resources described in the OFPR. Forest Practice Foresters (FPF), however, may decide that a site visit is warranted in order to advise the timber owner of potential areas of potential violation of the rules and thereby avoid citation. To aid in protection of resources, FPF's are encouraged to consult with other agencies when operations are in areas that have sensitive resources (OAR 629-605-100). Thus, a FPF may consult with the Department of Fish and Wildlife in regard to protection of fish and wildlife habitat, Department of Environmental Quality for air and water quality standard compliance, or the Oregon Department of Agriculture for pesticide use.

Further, the FPF may require a detailed plan if the operation could affect "sensitive" areas as set forth in the OFPRs (OAR 629-605-0170). These plans contain specific information on the location and design of roads and landings, drainage systems, disposal of waste materials, felling and bucking procedures, buffer strips, yarding systems, measures to protect riparian management areas, and other applicable actions. Of interest, these plans do not, at present, require approval by the FPF (Section 14, chapter 740, Oregon Laws 2003). However, the law directs the FPF to evaluate the plan and explain to operators where infractions (and subsequent penalties) will likely occur. Table 5-2 summarizes the comparison of the two state's forest practices laws with respect to these pre-harvest actions, categorized into phases that typify the primary pre-harvest activities.

**Table 5-2: Comparison of California and Oregon Pre-Harvest Regulatory Requirements**

<b>California Forest Practice Act (1973)</b>	<b>Oregon Forest Practices Act (1971)</b>
<b>Notification</b>	
Filing of Notice of Intent to Harvest – pertains only to commercial timber operations	Written Notice of Operation to ODF required at least 15 days prior to start of operations.
Notify neighbors, county and CDF in writing	“Operations” include numerous land management activities not just logging (e.g., chemical application).
Notice of Submission sent to any who request it in writing	
Multi-agency Review Team formed, lead by CDF	
<b>Planning</b>	
THP required for every operation > 3 acres	May be required <u>by rule not statute</u> if operations are within a pre-defined proximity resource “sensitive” areas or ODF deems necessary
THP is a functional equivalent of an EIR under Calif. Environmental Quality Act (CEQA, 1970)	
THP addresses feasibility, location, silviculture, logging, roads/bridges/erosion controls, water resources, wildlife, archaeological sites, pests, cumulative impacts, and mitigation measures	Written plans address roads and landings, erosion controls, logging system, water resource protection, logging waste disposal
Minimum 60 day period from NOI to start of operations	
<b>Pre-harvest Inspection</b>	
Within 20 days of THP submission, on-site inspection by CDF may occur; 95% are inspected	ODF site visit optional prior to start of operations.
Other state or federal agency officials may elect to attend if deemed necessary	
Members of public may attend if approved by CDF	
<b>Public Review</b>	
Minimum 30 day period for public to comment on proposed THP	No public review but members of the public may examine notifications and written plans, if required.
CDF must respond to those comments deemed significant	
<b>Agency Approval</b>	
CDF approval based on Review Team findings	No formal approval per 2003 legislation; consultation with operator can identify potential liabilities.
Other state agencies may file Letters of Non-Concurrence that CDF must consider but does not have to agree placing the landowner in the middle of disputing agencies.	ODF inspectors are encouraged to consult other state and federal agencies when operations may sensitive resources
Regional Quality Control Board has final approval authority (begun in 2003)	
Denials can be appealed to BOF	

### *Requirements during Harvest*

In contrast to California where the RPF is required to inspect operations, Oregon's Forest Practices Forester may inspect the site during or after operations to monitor compliance with the OFPR's (OAR 629-670-0100). Table 5-3 summarizes the comparison of California's regulatory requirements and actions during harvesting operations with Oregon's. Unannounced inspections are most likely in areas where there is potential to significantly impair other environmental resources such as soil, water, and air, and where consultation with the operator has already taken place. However, FPF's are not required by law to inspect a proposed logging site. If inspected, the FPF has authority ranging from simple citations to correct violations up to civil and criminal penalties. In general, the more egregious the violation, the greater is the penalty. Thus, operators could potentially ignore a violation and take a chance that they would not be inspected, but they run the risk of severe penalties, especially if violations were intentional.



**Table 5-3: Comparison of California and Oregon Harvesting Regulatory Requirements**

California Forest Practice Act (1973)	Oregon Forest Practices Act (1971)
<b>Logging Season</b>	
Restricted to 6 month period between March 15 and October 15 in Coastal District; winter logging in Northern District can be permitted if deemed viable by CDF	No general logging season restrictions.
All operations must cease and roads prepared for winter season by October 15.	
<b>Inspections</b>	
Required inspection by CDF forest practices inspector during operations	OFPF may elect to inspect if provided reason to suspect violations are occurring, or required to inspect if a specific violation is reported.
<b>Best Management Practices</b>	
BMPs are mandated through highly prescriptive CFPA rules; little variation in rules exist despite the wide diversity of forested environmental conditions; <i>in lieu</i> alternative rules are permitted but invite extra scrutiny, justification and approval	Specific protection standards and BMPs; <i>in lieu</i> actions requires written permission and consultation with other agencies
Ground yarding restriction based on slope and erosion hazard potential	
Permanent road design and maintenance dictated by numerous topographic, hydrologic and environmental factors	
Clear cutting permitted except in So. Subdistrict of North Coast district (4 coastal counties); clear cut size limited to 40 acres with exceptions possible	Clear cutting permitted statewide; clear cut size limited to 120 acres.
<b>Exclusion Zones</b>	
Equipment exclusion in riparian areas	
Width of riparian protection zone based on stream class, slope and erosion hazard rating	
<b>Enforcement Actions</b>	
Notice requiring corrective action, civil fines, criminal proceedings, suspension or loss of RPF license.	Set of complex fines and civil penalties defined by formulas that incorporate degree of violation of environmental standards.
	2004 Ballot Measures 37 requires compensation for reduction in fair market value resulting from application of land use regulations.

*Post-Harvest Requirements*

ODF’s Forest Practice Foresters (FPFs) can, but are not required to, inspect harvest sites to ensure that they are reforested within one year of the operation and are “free to grow” within six

years. California has similar requirements that keep the THP incomplete until at least two years after logging operations have ceased. Table 4 summarizes the requirements of the two states.

**Table 5-4: Comparison of California and Oregon Post-Harvest Regulatory Requirements**

California Forest Practice Act (1973)	Oregon Forest Practices Act (1971)
<b>Inspection</b>	
Completion of harvesting report must be filed with CDF and a post-harvest inspection must be conducted to ensure compliance with all rules.	Required to inspect for violation if notified by any public or agency individual
	Reputation of both operator and individual claiming a violation affect determination by ODF to inspect
<b>Regeneration</b>	
THP remains active until tree stocking requirements are met. If requirements are not met within 3 years of the completion of harvesting, CDF may hire a contractor to replant and bill the landowner.	Regeneration of harvested areas must be completed within 2 years of cessation of logging operations and free-to-grow within 5 years.

Before presenting the results on logging costs, it is perhaps valuable to briefly describe timber harvesting operations in general and specifically focus on those activities that have the greatest potential for adverse environmental impacts.

### **The Timber Harvesting Process**

Timber harvesting (logging) is a complex production process involving numerous value-added decisions each with the potential to harm the environment and workers. In recent decades, logging has been labeled as synonymous with exploitation, forest destruction and environmental damage. There is no dispute that this label is deserved based on past logging practices in the developed world, and currently in the developing world. There is a legitimate argument for regulating logging practices. Under the direction of a professional forester, modern logging practices can not only have minimal environmental and social impacts but can even have net positive effects. Loggers in California must be licensed (Licensed Timber Operator, LTO) just like foresters (Registered Professional Forester, RPF). Furthermore, countless regulations in California’s FPA are directed toward LTO conduct.

The terminology of logging has been infused into our culture. Terms like skidding gave rise to the phrase “skid row” (an actual street in Portland, OR) referring to places where people seem to

be *down on their luck*. Table 5-5 provides some definitions of logging terms needed for understanding these results.

**Table 5-5: Definition of Logging Terms**

<b>Term</b>	<b>Definition</b>
Felling	Cutting down a tree using either manual-driven chainsaw or remotely-operated mechanical equipment (i.e., feller-bunchers)
Bucking	The process of merchandizing (“breaking down”) a felled tree into logs of standardized, or mill-specified, lengths; commonly 16 feet in the West
Yarding (skidding)	Transporting logs from the felling location to a concentration point (i.e., a landing)
Loading	Lifting logs from the ground and placing them in bunks attached to trucks
Hauling	Transportation of logs from the landing (point of loading) to the timber (or log) purchaser’s facility.
Delimiting (limbing)	Removal of branches from the main stem of the tree prior to yarding
Choker-setting	The process of attaching cables to logs (typically large logs) which are then attached to yarding equipment
Board foot	A solid (free of defect) volume of wood measuring 1” thick x 12” wide x 1 foot long
Scaling	Estimation of the solid board foot content of a log (net of unusable, defective wood tissue)

Generally, logging encompasses all activities from layout of logging activities and road construction to final loading onto log trucks. The cost of transporting logs to the mill, hauling, of the timber purchaser represents the FOB price of the raw material to the mill operator. Because hauling costs are basically a function of distance from landing to mill, most in the industry separate transportation costs from the delivered log cost leaving logging costs as a function of all operations from “stump-to-truck.”

Timber harvesting operations begin with layout where the spatial design of operations is planned. Logging layout is a constrained optimization problem with the goal to minimize logging costs. The primary constraints are the location of the timber to be harvested relative to existing roads, topography, and environmentally sensitive areas. A key component of this phase is the location of permanent roads (if new ones are needed) and landings where logs are concentrated for loading onto trucks for transport to mills.

Tree felling can begin fairly early once the timber to be harvested is identified (“marked”) and layout has been completed. Directional felling of timber is important to minimize soil disturbance during yarding and to avoid breakage. The felled timber is subsequently delimbed and bucked. Yarding logs to the landing takes place well after felling and bucking crews have departed.

The next phase of operation involves “setting-up” yarding equipment. In the western U.S., three basic types of logging operations exist: (1) those where logs are dragged on the ground using tractor or rubber-tired skidders, (2) cable yarding where logs are lifted off the ground with a moving cable system, and (3) helicopter (even balloon) where logs are “flown” off-site. Clearly, ground-based logging has the greatest potential for environmental damage but is generally the lowest cost, cable yarding is the next most costly, and helicopter the most costly but having the least environmental impact.

The logging process has been completed once logs have been yarded and loaded onto log trucks, transported to the mill where the logs are unloaded and scaled. Commonly in the West, timber is purchased on a net scale basis (gross scale minus estimated defective board foot volume) with periodic payments to the timberland owner as the timber is harvested.

### **Logging Cost Determinants**

Logging costs have been traditionally expressed in dollars per thousand board feet. The value of timber in log form is based on the net board foot volume (volume of “soildwood” -- free of any defective, un-useable wood tissue). However, logging costs are based on gross scale since the weight and size of the log is that which is being moved. Modern-day logging is a highly capital intensive operation where large machinery is used in all phases of operation. This trend has been driven by technological advances in mechanization and the trend toward smaller timber available for harvest.

The primary factors that affect the magnitude of logging costs begin with the mix and organization of equipment involved in the operation. Balancing the equipment to maximize productivity (minimizing equipment inactivity) is a complex science and art. As already

mentioned, ground-based systems are the least expensive with helicopter systems the most expensive. Environmental regulations can influence this selection because of the potential for soil disturbance from the lower cost ground-based systems; such is the case in California.

Other basic factors that have a significant influence on cost and which may be affected by environmental/forest practice regulation (or worker liability policy) include:

- harvestable volume per acre;
- average tree (or log) size;
- total acreage of timber sale;
- average yarding distance (related to road and landing location);
- size and spatial orientation of areas removed from or inaccessible to felling and/or heavy equipment entry;
- labor costs (including benefits such as workers compensation premiums).

### **Environmental Impacts from Logging**

As with all human behavior, essentially all phases of logging operations have the potential for environmental damage. Improper planning is the phase that offers the greatest potential to cause damage and is therefore appropriately the primary emphasis of California's FPA as expressed in the Timber Harvest Planning (THP) process (Thompson and Dicus 2005). However, many in the industry contend that this process has expanded to the point where the rules have little positive environmental value and are more a response to legal or public opinion pressures (Campbell 2004).

Back in the 1970s, when the CFPA was enacted, the primary social concerns were the silvicultural practice of clear cutting, crop rotation frequency, and of course, "old-growth" protection. (We will not attempt to engage in the polemics of "old-growth" in this study. In our view this term has become so value-laden that a scientific definition is irrelevant.) This explains why more emphasis was placed on sustainable yield in the original legislation rather than other environmental values and concerns – important but secondary nonetheless.

As discussed earlier, the CFPA was forced to conform to the California Environmental Quality Act (CEQA) in 1975, incorporating a new array of regulations including public disclosure procedures, mitigation measures, and cumulative impacts analysis (Delfino 2004). However, these requirements did not appear to impact THP preparation costs until around 1993 when a major revision of the CFPA was undertaken by the CBOF (Thompson and Dicus 2005). Since then THP preparation costs have increased dramatically driven by regulatory concerns over water quality, wildlife habitat, and the endless debate over “old-growth.” The question remains whether the regulatory changes especially since 1993 have had similar effects on logging costs as with THP preparation costs.

### **Paired California and Oregon Timber Sales**

As described in Methods, data on logging costs were solicited from forest products firms in California. Specifically, we requested costs of felling, bucking, yarding and loading, annualized for as many years back in history for which the firm has records. Two firms submitted data.

One firm undertook an internal investigation to identify logging operations (associated with timber sales) in 2003 and 2004 that were similar in most respects except one was in Oregon and the other in California. The criteria used for pairing sales were total sale volume, truckload averages, sale acreage, silvicultural prescription, topography, average yarding distances, and harvest method. Two paired sales resulted (summarized in Tables 6a and 6b).

In the case of sale comparison A (Table 5-6a), both sales used ground-based mechanical systems, each with one feller-buncher, two skidders, one delimeter and one loader. The logging companies were both based in the state where they occurred. The two sales possessed very similar average log (piece) size, identical yarding distances and ground slope, and very similar production rates as measured by load truckload average and truckloads per day. However, the California sale had a much larger harvest area with the vast majority comprised of “partial cut” or thinnings resulting in one-third the volume per acre harvested than in Oregon. This would make the California stump-to-truck logging operation more expensive – about seventy-five dollars per thousand board feet (mbf) compared to nearly fifty-two dollars per mbf for the

Oregon sale. There is no valid way to standardize these costs for the different production rates since the relationship is not linear and is confounded by many other operational considerations.

**Table 5-6a: Summary Table for the A Sales**

Sale attributes	Oregon	California
Total logging cost (\$/Mbf) <sup>1</sup>	\$59.65	\$86.38
Road watering cost (\$/Mbf) <sup>2</sup>	\$7.51	\$11.05
Slash treatment cost (\$/Mbf)	\$0	\$0
Road reconstruction cost (\$/Mbf)	\$0	\$0
<b>Total adjusted cost (\$/Mbf)</b>	<b>\$52.14</b>	<b>\$75.33</b>
Estimated workers compensation rates (\$/Mbf) <sup>3</sup>	\$0.99	\$13.77
Fuel cost (\$/Mbf) <sup>4</sup>	\$7.26	\$11.66
<b>Total adjusted cost accounting for fuel and comp (\$/Mbf)</b>	<b>\$43.89</b>	<b>\$49.90</b>
Production (truck-loads/day)	14	11
Truckload average (Mbf/ld)	4.279	4.443
Average volume per acre (Mbf/ac)	15	5
Total sale volume (Mbf)	1,634	4,745
Average piece size (bf/log)	104	101
Silviculture		
Clear cutting acres	80	59
Partial Cutting acres	30	889
Average yarding distance (feet)	800	800
Average slope (%)	20	20

<sup>1</sup> Total logging costs was the bid price for each sale.

<sup>2</sup> Cost based on an hourly rate for a 10 hour day divided by volume per day. The hourly rate for Oregon was \$45/hr, and for California \$54/hr.

<sup>3</sup> Rates were calculated based on an approximate rate for each state. Actual rates may vary. Rate used for California was \$68 per \$100 payroll dollars. Rate used for Oregon was \$6 per \$100 payroll dollars

<sup>4</sup> Fuel cost were calculated using a rate of \$1.45/gal for Oregon and \$1.90/gal for California.

California has experienced significant increases in workers compensation rates (WCR) in the last five years and generally has higher fuel costs due to taxes which arise from the higher air quality standards in California compared to Oregon and most other states. California air quality regulations for diesel and gasoline blends are far more stringent than national standards (Air Resources Board 2003). In Sales A comparisons, fuel costs were fifty percent higher in California. In addition, workers compensation rates have tripled in California since 1998 (Neumark 2005). Differential WCR was observed in the Sale A comparison where WCR in California was sixty-eight dollars per one-hundred dollar payroll and only six dollars in Oregon. This difference was further exaggerated by the more costly logging operation in California, making the WCR/mbf almost fourteen times that of Oregon's sale.

Comparison of the B sales is a somewhat more complicated (see Table 5-6b). First, there were differences in the mix of logging equipment. The Oregon sale had one shared feller-buncher with two “sides” (a balanced mix of equipment from stump-to-truck) each for two rubber-tired skidders, delimeter and loader, while the California operation had one side with a mix like the Oregon sale. The ground in the California sale was steeper but contained some clear cut acreage; the Oregon sale was all thinning.

**Table 5-6b: Summary Table for the B Sales**

Sale attributes	Oregon	California
Total logging cost (\$/Mbf) <sup>1</sup>	\$114.24	\$129.09
Road watering cost (\$/Mbf) <sup>2</sup>	\$9.16	\$0
Slash treatment cost (\$/Mbf)	\$1.5	\$0.5
Road reconstruction cost (\$/Mbf) <sup>3</sup>	\$1.51	\$0
<b>Total adjusted cost (\$/Mbf)</b>	<b>\$102.07</b>	<b>\$128.59</b>
Estimated workers compensation rates (\$/Mbf) <sup>4</sup>	\$2.22	\$16.25
Fuel cost (\$/Mbf) <sup>5</sup>	\$15.94	\$13.76
<b>Total adjusted cost accounting for fuel and comp (\$/Mbf)</b>	<b>\$83.91</b>	<b>\$98.58</b>
Production (truck-loads/day)	14	11
Load average (Mbf/ld)	3.509	3.765
Average volume per acre (Mbf/ac)	6.06	3.29
Total sale volume (Mbf)	1,116	1,141
Average piece size (bf/log)	65	95
Silviculture		
Clear cutting acres	0	49
Partial Cutting acres	184	298
Average yarding distance (feet)	700	800
Average slope (%)	10	30

<sup>1</sup> Total logging costs was the bid price for each sale.

<sup>2</sup> Cost based on an hourly rate for a 10 hour day divided by volume per day. The hourly rate for Oregon was \$45/hr, and for California \$54/hr.

<sup>3</sup> The \$/Mbf cost was roughly estimated based on utilizing one cat for two 10 hour days at \$84/hr

<sup>4</sup> Rates were calculated based on an approximate rate for each state. Actual rates may vary. Rate used for California was \$68 per \$100 payroll dollars. Rate used for Oregon was \$6 per \$100 payroll dollars

<sup>5</sup> Fuel cost were calculated using a rate of \$1.45/gal for Oregon and \$1.90/gal for California.

However, there was about double the sale volume per acre in Oregon but with one-third smaller average log size. The result was that the Oregon sale produced fourteen truckload per day compared to eleven in California, not enough to make up for having twice the number of machines. The manager who provided the data was uncertain as to why the Oregon logging costs (less fuel and WCR) were about fifteen percent cheaper. The differences in WCR and fuel costs were also mitigated by the more equipment-intensive Oregon operation; still WCR was over seven times that of Oregon’s on a per thousand board foot basis.



## Trends in California Logging Costs

Having determined from the paired sale information that fuel costs and workers compensation rates are higher in California, trends in these costs may account for increases in logging costs unique to California. Figure 5-6 illustrates the trend in logging costs in California and other price series indexed at 100 in 1991. The California logging cost trend data were provided by one firm and can be compared to the PPI Logging Cost Index. A wide range of goods and services comprise the Producer Price Index. Figure 5-6 compares annual costs for diesel, gas and workers compensation rates unique to California with logging costs; however there does not appear to be any correlation.

**Figure 6: Average, Annual Logging Costs Reported by Industry in California compared to the PPI Logging Cost, Diesel, Gas and Workers Compensation Rates**

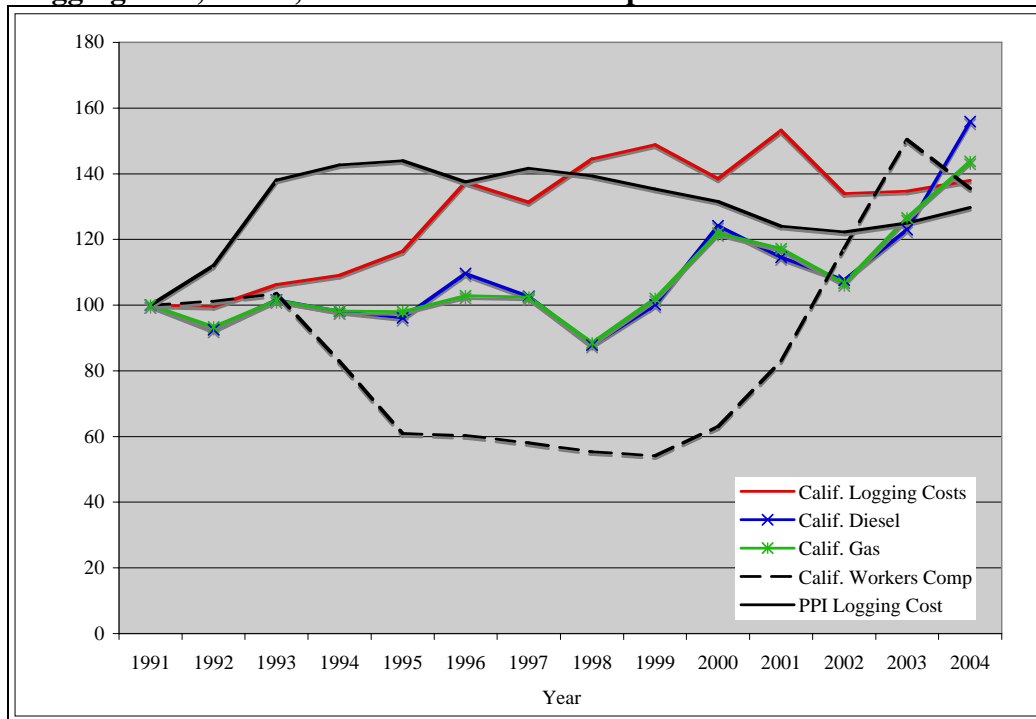


Figure 5-6 also shows the national PPI for logging costs as reported by the Bureau of Labor Statistics. The trends since 1991 seem to be inverted – the PPI Logging Cost trend rising rapidly in the early 1990s and then taper-off, whereas the California costs increase but mainly after about 1995. There may be some correspondence between the increase in California logging costs starting in 1995 and the adoption of a wide range of watershed protection rules in that same year

and continuing through 1997 (see Appendix I-2 for a chronological summary of CFPA regulatory changes). However, no statistical analysis of logging cost trends was undertaken due to insufficient number of observations.

### **Summary And Conclusions**

This study is part of a long-term project designed to assess the economic and ecological impacts of California's environmental regulations that are directed at forestry practices. Starting in the early 1970s, California began a course in forestry policy that is highly process-oriented requiring multi-agency approval prior to and during forestland management actions, particularly timber harvesting. Generally, these policies were not exactly "mainstream" in the United States. Whole regions within the U.S., including Oregon, pursued other forestry policy approaches that were generally less comprehensive and rule-based.

There are natural questions that arise from California government intervention into the private sector. How do these laws and regulations affect business and land use decisions? Are there other, more efficient policy approaches? How would a declining forest products industry in California affect forest health? These are just a few of the questions facing the state as the regulatory pressure increases on California's forest products industry and forestland owners.

A couple questions have already been addressed. Dicus and Delfino (2003) investigated the relationship between California's forest practice law and the growth in forest products firms and landowners who obtained national and international recognition for their quality resource management. Last year, Thompson and Dicus (2004) found a significant cost increase in timber harvesting planning (THP) from ever more strict regulations, especially starting in 1993. This study built upon the Thompson and Dicus study to address the regulatory impact on the next step in selling timber – the timber harvesting process itself.

Unlike the 2004 study on THP costs in which results were statistically significant, this study did not identify any significant effects from environmental regulations on the timber harvesting process. One of the likely causes was the lack of raw data, probably a product of our methodology that required data from firms operating in both California and another state, namely

Oregon. The need to compare California to Oregon was deemed necessary to detect cost effects from regulations since these two states have such distinctly different forest practices policies.

Results from the paired sales between Oregon and California identified some operational cost differences that bear further investigation. There is certainly a logging cost effect from California's more costly gasoline/diesel blends to deal with its air quality standards and much higher workers compensation rates (2004 legislation was passed attempting to control rising medical costs). The one regulatory effect that may deserve further investigation deals with the stringent requirements to protect watershed values beginning in the mid to late 1990s.

Although some effect on logging costs may be attributable to changing regulations, it is unlikely that they will be as significant as their effect on timber harvest planning costs. There is a logical reason for this other than what is indicated from the data obtained for this study. The California Forest Practices Act forces significant alteration of logging operations to protect environmental values but most of the effect is absorbed in planning costs and the fixed costs of designing the timber harvest. The spatial layout and design of the logging operation is done so as to minimize operating costs (felling, bucking, yarding and loading). The only likely component of logging that could be seriously affected by regulatory requirements would be in yarding and possibly felling when done mechanically. Costs of these logging components may have increased due to limiting or prohibiting operations in riparian areas. In 1997, new California regulations restricted operations affecting ephemeral streams (Class III). Any further research into the effects of forest practice regulations on timber harvesting costs needs to focus on specific regulations such as watershed and watercourse protection rules.

Perhaps the most important question would be whether California's more expensive and process-oriented approach has produced better results than policies in other states like Oregon. That is to say, are California's environmental resources in better condition than Oregon's where far less public and private money is spent on regulating forestry practices? What are the social and ecological impacts of a demise of California's forest product industry? However, even if it could be shown that other states have more cost-effective policies, is it even possible to significantly alter California's policy after so many years of commitment to its rules and regulations?

## **Chapter 6: Summary, Conclusions, and Policy Recommendations**

This research report is the culmination of three separated but related studies. The first study examined what effects the regulatory environment is having on agricultural producers in California. A case study examining the effects of a delay in pesticide registration was the next study presented in this report. This study looked at the registration timelines of three pesticides which had received Federal registrations from the US Environmental Protection Agency (US EPA), but were subsequently delayed at the state registration level. The final study was a case study that examined the differing regulatory environments between California and Oregon in terms of the forest products industry. Since the two case studies are stand-alone reports, you can find their summary and conclusions in chapters four and five. This chapter will focus on summarizing the results from the producers' survey. It will also discuss the policy implications of the findings from the survey and provide directions on where future research should be headed regarding the regulatory environment.

### **Major Results from the Producers' Survey**

The first study conducted for this project was meant to identify key issues with the California regulatory environment from the standpoint of the producers. This issue was investigated with the use of a producers' survey that was handled through the California Agricultural Statistics Service. Out of 10,000 surveys sent out to producers, 1323 usable surveys were returned. This survey examined producers perceptions and attitudes regarding the regulatory environment and was categorized into five major areas—general information, regulatory environment, regulatory compliance costs, technological choice, and managerial issues. From this survey, a cost of the regulatory environment as it pertains to operating cost was estimated. An in-depth look at how ten regulatory areas are affecting producers in the forest product, tree fruit, nut, and vegetable crop industry from both a cash and non-cash standpoint were investigated. A ranking of these regulatory areas was developed for fourteen different specialty crop industries that were the focus of this research.

A large percentage of producers find some level of complexity in the California regulatory environment. Approximately seventy-four percent of California producers classify the regulatory environment at a minimum as Somewhat Complex. Over twenty-one percent indicated that the regulatory environment is Very Complex. Nearly thirty-percent of the respondents found the regulatory environment Somewhat Complex, while approximately twenty-three percent identified the regulatory environment as Complex.

Many of the producers in the state believe there is duplication in effort by different regulatory bodies. Nearly fifty percent believe that there is some duplication of effort, while approximately twenty percent believe there is a lot of duplication of effort between the agencies. Seventy percent of producers reported duplication at the local level, sixty-five percent at the state level, and fifty-one percent at the federal level.

As a whole, producers identified workers' compensation, air quality regulations, and land use regulation as the top three regulatory areas having a negative impact on their financial, operational, and managerial aspects of production. This impact takes into consideration both cash and non-cash costs. While some producers indicated that the regulatory areas had a negative impact on their operations, there were also a group of producers who indicated that the regulatory areas had a positive impact. At thirty-seven percent, pesticide application had the largest perceived positive impact. Pesticide registration and food safety regulations round out the top three regulatory areas positively impacting producers at thirty-three and thirty-one percent respectively. If you exclude food safety and wildlife protection, over fifty percent of the producers are either negatively affected or positively affected by the different regulatory areas. Hence, regulations do have a noticeable effect on producers.

Compliance costs were examined for five different types of costs. One of the costs can be identified with direct out-of-pocket expenses, while the other three may have some indirect cash costs but are primarily non-cash based. The producers identified the four compliance costs that do not directly affect out-of-pocket expenses as having a greater impact than the direct cash costs. This would imply that a study that examines only the direct cash cost would be an underestimate of what the true cost of regulations is to the producers.

In the last five years producers reported that they invested one in every nine dollars to capital investment for regulatory compliance. For every dollar that is allocated towards regulatory compliance through capital upgrades, sixteen percent is allocated to workers safety; thirteen percent goes to abatement of water discharge, nine percent to abatement of air emissions, and six percent towards providing wildlife habitat. Over eighty-seven percent of the producers who made capital upgrade due to regulatory compliance found no gain in efficiency from making the upgrade. Out of the nearly thirteen percent of producers who believed they gained efficiency from making the capital improvements, over seventy percent believe that the gain in efficiency did not compensate the increase in cost. Only eight percent of the producers in the study received cost share assistance for improving capital equipment to meet regulatory standards. These results would suggest that most producers are not directly benefiting from regulatory induced capital investment.

In the last five years, producers have noticed a sixty-nine percent increase in the amount of operating cost allocated to regulatory compliance. Producers estimate that in 1999, they allocated 6.30 percent of their operating cost to regulatory compliance. This percentage increases to 10.67 percent in 2004.

Producers were asked to identify the top three regulatory areas increasing their operational costs. Producers identified workers' compensation, pesticide application, and air quality regulations as the top three. This ranking is different from the one given for negatively impacting areas. This result coupled with the rankings from the impact question suggest that there are some non-cash costs that are having an effect on the producer enough to change the relative ranking of some of the regulatory areas.

All the fees investigated in the survey have increased over the last five years. Water quality fees were 968 dollars in 1999 and increased to 993 dollars in 2004 representing an increase in 2.6 percent. Solid waste fees increased 5.2 percent in this same time period. Many fees over the last five years have substantially increased for the producers. Burning permits averaged thirty-eight dollars in 1999 and have increased to 129 dollars in 2004 representing a 240 percent increase in costs. Air quality fees have increased 940 percent from 1999 to 2004. Chemical use fees have

increased by only 125 percent. In this same time period, workers' compensation has increased on average by 11,625 dollars representing a 180 percent increase. Producers estimate that in 2004, they paid an average cost over 18,000 dollars for workers compensation.

Around sixty-one percent of the producers believe that the regulatory environment has affected their ability to effectively manage their farms. Producers have seen a forty-percent increase in their management time allocated toward regulatory issues in the last five years. They estimated that in 1999, they spent 7.31 percent of their time on regulatory issues. This increased to 10.27 percent in 2004.

California's regulatory environment is identified by producers as being more restrictive than other states. Less than five percent of the survey respondents have operations outside of California. Of the group that does produce outside California, approximately seventy-four percent found the California regulatory environment more restrictive than the other state/country they are producing in. Only eleven percent of the producers found that California's regulatory environment is less restrictive.

The regulatory environment in California is driving producers in the state to consider either downsizing their operations or leaving agriculture altogether. The option that was considered most by producers was leaving agricultural production. Over forty-five percent of producers have considered leaving agriculture because of the regulatory environment. Results from the survey imply that producers are more likely to exit the industry or prepare to exit the industry rather than increase their operational size to potentially gain economies of scale. It appears that producers would prefer to leave agricultural altogether rather than leave California.

### **The Cost of the Regulatory Environment on California Producers**

California producers are paying a hefty sum for regulatory compliance. The estimated regulatory cost in relationship to operating costs for producers is between \$2.19 billion to \$2.21. It must be emphasized that this estimated range is a lower bound on the cost of regulatory compliance that producers must pay. Due to limitations in the survey, no estimate was made for the capital costs that are incurred by producers due to the regulatory environment. To put the amount that

California producers spend on regulations into perspective, California producers pay more in regulatory costs than Tennessee produces in total agricultural production. It should be noted that Tennessee is ranked 31<sup>st</sup> in agricultural production for the country. This amount is greater than the combined sum of agricultural production from Alaska, Rhode Island, New Hampshire, Massachusetts, Nevada, Maine, and Connecticut.

While large income producers, those earning over 500,000 dollars in income, are paying the majority of the regulatory costs, middle income producers are paying a higher percentage of their income towards regulatory compliance. At approximately eighty-seven percent, the largest producers are paying the lion's share of the regulatory costs. Examining the percentage of income devoted towards regulatory compliance, many of the middle income brackets have higher percentages. The range on percentage of income allocated to regulatory cost is between 5.24% to 9.19%. It appears that there are gains to be made in cost savings to being a large operation because economies of scale favor the larger producer in regards to regulatory compliance.

### **The Regulatory Areas Most Affecting the Forest Products, Tree Fruit, Nut, and Vegetable Crop Industries**

The regulatory environment is considered complex by many agricultural industries in California. Eight industries had over fifty percent of their producers identify the regulatory environment as either Complex or Very Complex. These industries were: the melon industry, the berry industry, the stone fruit industry, the leafy vegetable industry, the timber industry, the tree nut industry, the grape industry, and the root vegetable industry. Nine out of the fourteen industries had less than twenty-five percent of their producers indicating that the regulatory environment is Not Complex. It is clear from the producer's survey that most industries find the regulatory environment in California as at a minimum Somewhat Complex by a vast majority of the producers.

### **Summary of the Rankings from the Industry Analysis**

Examining how each regulatory area affects each industry of importance in this study, an identification of the top three regulatory areas was done above. A regulatory area was identified



as a top three issue if it ranked in the top three for both increasing operating costs and having a negative impact on the producer. It should be noted that the miscellaneous fruit industry was composed of commodities like avocados, olives, etc. The miscellaneous vegetable industry was made up of corn producers, water cress producers, artichoke producers, etc.

Out of the ten regulatory areas examined in this report, producers in different industries identified only five that are top on their list. Eleven industries found that workers compensation was a top three regulatory issue making it the top regulatory area on the minds of producers in the survey. The regulatory area of land use was ranked in the top three for the berry industry and the miscellaneous vegetable industry. Pesticide registration ranked in the top three for the citrus industry, the deciduous fruit industry, and the miscellaneous fruit industry. The citrus industry, the miscellaneous fruit industry, the stone fruit industry, and the root vegetable industry all chose pesticide application as one of their top three issues. Air quality regulations were top three for deciduous fruit industry, stone fruit industry, grape industry, and the tree nut industry.

### **Policy Implications of the Producers' Survey**

There are a few major policy implications that come out of this research project from the regulatory study. Given that approximately forty-four percent of the producers in the survey identify the regulatory environment as either Complex or Very Complex, it is recommended that work be done to examine whether the complexity of the regulatory environment is unduly complex. Government agencies should strive to minimize the level of complexity of the regulatory environment while still meeting the goals of the regulations.

Part of the complexity problem may be caused by the perceived duplication of effort between regulatory agencies. If the producers' perception is valid, there may be an opportunity for the government to gain some efficiency by tracking down where the duplication is occurring and try to minimize it. Policy efforts should be directed towards discovering where duplication exists and minimizing the cost related to the duplicated efforts.

Workers' compensation is on the top of the list of regulatory areas affecting producers. With a 180 percent increase in the last five years, the California government should put this as a top regulatory issue that needs a solution.

With so few producers receiving cost share assistance for capital investments due to regulatory compliance, effort should be taken to see if policies in the state can be developed to encourage producers to participate in cost share assistance programs. It is unclear why many producers are not using the programs that exist to offset their costs. It may be that producers believe that the effort it takes to obtain the assistance outweighs the benefits. A more likely answer is that the producers in the state do not know about all the programs that exist.

Every indication in the survey shows that the regulatory environment is increasingly absorbing more and more of the producers' resources. The most important policy implication of this work is that government regulatory agencies need to make an effort to minimize the impact of the regulatory environment on producers while still maintaining their goals. This requires them to not only examine the marginal effect of a regulation on the regulatory environment, but to also the cumulative effect.

### **Future Research**

While this research has brought many facts to light on the producer's view of the regulatory environment in California, it opens the door to many research questions that need further examination. With so many producers indicating that the regulatory environment is at a minimum Somewhat Complex, there are many questions that need to be explored about the complexity of the environment. It would be valuable to first know the source of the complexity. Is the regulatory environment in California complex due to the number of regulations and/or the number of government agencies? Is it how the regulations are written? The producers' survey did not get into any of these questions, but they should be explored.

Another issue that needs to be examined in-depth is the issue with duplication of effort. Many producers in the survey indicated that they have encountered duplication of efforts by differing

regulatory agencies. Research should be conducted on where this duplication is occurring, how is it affecting the regulatory environment (especially the level of complexity), and is the duplication necessary or efficient?

A cost of the regulatory environment was provided by this research. But this estimated cost was only a lower limit of what the true cost is. This study did not examine the cost of capital investment incurred due to the regulatory environment. This could be a significant cost that has yet to be determined. Hence it is necessary that future research attempts to estimate this cost. From the producers survey it is known that approximately eleven percent of producers' capital investment goes towards regulatory compliance. These cash costs are not the only costs that need to be considered. The survey showed that there are some non-cash costs that need to be examined also. More work needs to be done identifying what all these costs are and what is their true impact on the producers. These non-cash costs could be the ones that will drive producers out of the agricultural industry. It was seen in the survey that over forty-five percent have considered this option.

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## **Appendix A: The Producers' Focus Group**



September 27, 2004

Dear:

A research project entitled *Analysis of the Regulatory Effects on California Specialty Crops: An Examination of Various Issues Impacting Selected Forest Products, Tree Fruit, Nut, and Vegetable Crop Industries* is being conducted by Drs. Sean Hurley and Jay Noel from the Department of Agribusiness at California Polytechnic State University—San Luis Obispo in cooperation with Dr. Lori Berger of the California Minor Crops Council. You have been chosen to participate in an industry roundtable because it is believed that you could provide valuable insight on how California agricultural producers are handling the current regulatory environment. This study is primarily meant to investigate the regulations that producers find most burdensome.

Prior to your arrival to this roundtable discussion, you are asked to develop a list of five to ten aspects of the regulatory environment that create the greatest burden for California specialty crop producers. Regulatory environment is meant to encompass regulatory programs/policies (water quality standards, air quality standards, labor standards, California pesticide registration policy, etc.), regulatory enforcement (number of regulators, consistency among differing regulatory bodies, etc.), and the changing regulatory environment (number of regulations, speed at which new regulations are being enacted, conflicting nature of regulations, uncertainty due to regulations, etc.). If possible, please send, prior to your arrival to the meeting, a list of these top five to ten issues to Dr. Hurley at [shurley@calpoly.edu](mailto:shurley@calpoly.edu). On the day of the roundtable, you will participate in an exercise that will help elicit a ranking of the regulatory issues identified by the group of participants.

The date for this industry roundtable is Tuesday, October 12, 2004 from 9:00 a.m. to noon with a working lunch; we will adjourn by 1:00. The location of the meeting is 4500 S. Laspina, Tulare, CA 93277 at the Heritage Complex. This is just across the street from the Tulare County Ag Commissioner/UCCE office.

Travel and lodging for this event will be compensated up to the allowable amounts dictated by Cal Poly Foundation rules for travel. Original receipts accompanied with the enclosed travel claim form for all incurred travel, meals, and lodging expenses will need to be submitted to Sean Hurley for reimbursement. Snacks, refreshments, and lunch will be provided on the day of the meeting.

Please RSVP to Lori Berger by October 7<sup>th</sup> at 559-688-5700 or [lori@minorcrops.org](mailto:lori@minorcrops.org). Lori will also be able to provide ideas on hotels in the Visalia/Tulare area should you need assistance.

If you have any questions regarding the study, please call me at 805-756-5050, and I will be happy to help you. Thank you for your consideration to be in this study.

Sincerely,

Sean P. Hurley, Ph.D.  
Assistant Professor  
California Polytechnic State University—San Luis Obispo

CC: Jay Noel, California Polytechnic State University—San Luis Obispo  
Lori Berger, California Minor Crops Council

## Ranking Regulatory Issues

This research is being conducted to determine from your experience in working with your organization's members or fellow producers which regulatory issues have the greatest burden. Once you have identified these issues, you will next go through an exercise that will help you rank these issues. We have tried to set up this exercise in a relatively straightforward manner. The process is known as multi-attribute scaling and has been successfully used to make decisions in situations where 1) multiple factors are important, 2) no factor decision (or ranking in this case) is clearly best on all the factors, and 3) some factors are difficult to quantify.

The results of this exercise will guide us as we write a questionnaire for a statewide survey to elicit information on the burdens and costs of the regulatory environment on California agricultural producers. We want to thank you for participating in this study and providing valuable information.

### General Instructions for the Exercise

**Step 1:** We will start this exercise by identifying the most burdensome regulatory issues facing the member's of your organization or your fellow producers. You were sent e-mail on this question prior to your arrival, so hopefully this step can proceed quickly. As we proceed through the exercise we will attempt to gain consensus as we move through each step. The first step is to list the top five regulatory issues facing California producers. If you cannot capture the regulatory environment with five issues the list will be expanded.

**Step 2:** The second step in this regulatory ranking exercise starts with determining a set of agreed upon **general** set of burdens that you feel are associated with the current California regulatory environment. For example, a burden may be related to **time** that is required handling aspects of complying with the regulatory issue, or it could be **compliance costs** that are affected by the regulatory issue. These are just examples and you are encouraged to develop a list of burdens that you feel are most appropriate in characterizing the regulatory environment affecting your organization's members. The burdens need to be comprehensive or broad enough to account for most problems encountered by your members or fellow producers as they deal with the California regulatory environment. The burdens chosen need to be, to the extent possible, separate and non-overlapping and independent of each other.

**Step 3:** The third step in the ranking process asks you to develop components of each burden. For example, if compliance costs is a general burden. A component of that burden might be the investment cost required to comply with regulations. It is also possible that a specific general burden may not have any components. Please attempt to choose components that do not overlap with each other.



**Step 4:** The fourth step of the ranking exercise is to give weights to the burdens and their components. These weights are used to determine the relative importance of the burdens and the relative importance of the components that are important to a specific burden. This step requires that a ranking or scaled rating be created.

The determination of the trade-offs between burdens is your judgment about the relative importance of the burdens as they affect your members or fellow producers. These scales can be standard units (e.g. dollars for cost) or relative (e.g. degree of risk, high, medium, low). These scales are then transformed into 0 to 100 point scales. The sum of the weights given to the burdens must sum to 100.

For example if burden 1 is assigned a weight of 30, burden 2 receives a 10, burden 3 receives 25, burden 4 receives 15, and burden five receives 20. The sum total is 100.

This same process is used to elicit weights on the components that make up each burden. For example, suppose under a burden of compliance costs three components were listed: investment cost, cost of production, and managerial time and cost. Then, in general, as these components affect compliance costs they might receive the following weights: investment cost receives 20, cost of production receives 50, and managerial time and cost receives 30. These again total to 100.

**Step 5:** The fifth step in this exercise is to assign an importance value to each component of each burden for each of the identified regulatory issues. This importance value can be from 0 to 100. These values **do not** need to sum to 100. That is, an importance value of any given components of any given burden for any given regulatory issue can be assigned a value of 0 to 100 based on the relative importance of that component to that regulatory issue.

For example, suppose a component under compliance cost burden was investment cost. Investment cost might be very important to regulatory issue 1 but relatively unimportant to regulatory issue 2. Thus, investment cost might receive a value of 90 for regulatory issue 1 but a 0 for regulatory issue 2.

## **Appendix B: The Producers' Survey**

# California Agriculture and the Regulatory Environment Survey

## March 2005

Please make corrections to name, address and Zip Code, if necessary.

March 4, 2005

Dear Operator:

This survey is being conducted by the California Agricultural Statistics Service for the California Institute for the Study of Specialty Crops. Participation in this survey is voluntary and you are under no obligation to answer any particular question. Please be assured that your responses will be kept confidential. Your cooperation in completing this questionnaire is greatly appreciated and will be extremely useful in analyzing the impact of the California regulatory environment on the competitiveness of California specialty crop agriculture. If you have any questions, please call Sid Williams.

**PLEASE MAIL BY MARCH 22, 2005.**

### I. General Information

A. What type of business organization best describes your farm/ranch operations?

(Check only 1.)

Sole Proprietorship . . . . . \_\_\_\_\_  
General Partnership . . . . . \_\_\_\_\_  
Limited Partnership . . . . . \_\_\_\_\_  
Limited Liability Corporation . . . . . \_\_\_\_\_  
Corporation . . . . . \_\_\_\_\_

B. Do you consider your farm/ranch operation to be a family farm/ranch? . . . Yes \_\_\_\_\_ No \_\_\_\_\_

C. Please list the top three revenue-producing agricultural products grown on your farm/ranch.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

D. How many acres do you farm/ranch? . . . . . Acres \_\_\_\_\_

E. Does your farm/ranch produce certified organic products? . . . . . Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, what percentage of your farm/ranch gross income is accounted for by certified organic production? . . . . . Percent \_\_\_\_\_%

F. In which county is your farm/ranch primarily located?

\_\_\_\_\_

G. If you are a livestock, dairy, poultry, or aquaculture producer, what is the usual size of your:

livestock herd? . . . . . Head \_\_\_\_\_

dairy herd (cows being milked)? . . . . . Head \_\_\_\_\_

flock? . . . . . Head \_\_\_\_\_

fish stock? . . . . . Head \_\_\_\_\_

H. During the past five years, what was the average annual gross income for your farm/ranch operations?  
(Check only 1.)

- Less than \$10,000 . . . . . \_\_\_\_\_
- \$10,000 - \$49,999 . . . . . \_\_\_\_\_
- \$50,000 - \$99,999 . . . . . \_\_\_\_\_
- \$100,000 - \$249,999 . . . . . \_\_\_\_\_
- \$250,000 - \$499,999 . . . . . \_\_\_\_\_
- \$500,000 or More . . . . . \_\_\_\_\_

I. What percentage of your five-year average gross income was used to pay:  
fixed costs (management cost, overhead, etc.)? . . . . . Percent \_\_\_\_\_ %  
operating costs (labor, energy, fuel, etc.)? . . . . . Percent \_\_\_\_\_ %

**II. Regulatory Environment**

A. How would you describe the complexity of the regulatory environment? (Check only 1.)

- Not Complex . . . . . \_\_\_\_\_
- Somewhat Complex . . . . . \_\_\_\_\_
- Complex . . . . . \_\_\_\_\_
- Very Complex . . . . . \_\_\_\_\_

B. How much duplication of effort have you found among regulatory agencies? (Check only 1.)

- None . . . . . \_\_\_\_\_
- Some . . . . . \_\_\_\_\_
- A lot . . . . . \_\_\_\_\_

C. In which agencies have you found duplication of regulatory compliance effort to exist?

Local Agencies (Regional Water Quality Control Board, Regional Air Quality Control Board, County Planning Department, City Planning Department, etc.) Yes \_\_\_\_\_ No \_\_\_\_\_

State Agencies (Cal EPA, California Department of Food and Agriculture, California Department of Pesticide Regulation, etc.) . . . . . Yes \_\_\_\_\_ No \_\_\_\_\_

Federal Agencies (U.S. Food and Drug Administration Department, Environmental Protection Agency, U.S. Fish and Wildlife, etc.) . . . . . Yes \_\_\_\_\_ No \_\_\_\_\_

D. Currently, how many different regulatory agencies do you directly deal with concerning regulatory compliance of your farm/ranch operations?

Local Agencies (e.g., Agricultural Commissioner, County Planning Agency) . . . . . Number \_\_\_\_\_

State Agencies (e.g., California Department of Pesticide Regulation) . . . . . Number \_\_\_\_\_

Federal Agencies (e.g., U.S. EPA, Occupational Safety and Health Agency) . . . . . Number \_\_\_\_\_

E. In order of their impact, please list up to three local, state, or federal regulatory agencies that have positive and negative impacts on your farm/ranch operations.

Positive Impact:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Negative Impact:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

F. Please rank the following regulatory areas as to how they compare one against another as to their possible financial, operational, and managerial impacts on your farm/ranch.

In the "Impact" column, enter "0" for no impact, "1" for a positive impact, or "2" for a negative impact.

In the "Rank" column, rank each regulatory area where you have indicated a positive or negative impact using "1" for the greatest impact to "10" for the least impact. Please leave blank if unable to rank.

Regulatory Areas

	Impact	Rank
Air Quality . . . . .		
Food Safety . . . . .		
Land Use . . . . .		
Occupational Hazards and Safety . . . . .		
Pesticide Application . . . . .		
Pesticide Registration . . . . .		
Solid and Hazardous Waste Disposal . . . . .		
Water Quality . . . . .		
Wildlife Protection . . . . .		
Workers' Compensation . . . . .		

G. Please rank the following **regulatory costs that have an impact** on your farm/ranch.

If those costs are not impacted, enter a "0".

Rank the costs using "1" for the greatest impact to "5" for the least impact. Please leave blank if unable to rank.

	Rank
Cash Compliance Costs ( <i>capital expenditures, operating costs, regulatory fees, etc.</i> ) . . . . .	
Non-cash Costs ( <i>time, education and training, confusion, paperwork, etc.</i> ) . . . . .	
Indirect Costs ( <i>lack of flexibility in land-use decisions, reduced crop selection and rotation choices, reduced decision-making flexibility, etc.</i> ) . . . . .	
Risk and Uncertainty ( <i>liability risk, litigation risk, etc.</i> ) . . . . .	
Pesticide Application . . . . .	
Pesticide Registration . . . . .	
Technological Choices ( <i>restrictions on technological choices</i> ) . . . . .	

### III. Regulatory Compliance Costs

A. What percentage of the **actual total capital investments** (*not the amount financed or depreciated*) made on your farm/ranch **over the last five years** were for regulatory compliance? . . . . .  
 . . . . . Percent \_\_\_\_\_%

B. Approximately what percentage of the capital investments that went to satisfy regulatory compliance went to the following regulatory areas? If this percentage cannot be estimated, please leave blank.

Regulatory Areas	
Abatement of water discharges off the farm/ranch . . . . .	Percent _____%
Abatement of air emissions from the farm/ranch operational activities . . . . .	Percent _____%
Worker health and safety equipment, including chemical application protection . . . . .	Percent _____%
Wildlife habitat . . . . .	Percent _____%

C. Has your farm/ranch operation gained operational efficiencies (e.g., less energy-use per unit output, etc.) due to capital investments made to satisfy regulatory compliance for any of the areas listed above? . . . . . Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, have the efficiency gains resulted in lowering operation costs enough to pay for the required regulatory capital investments? . . . . . Yes \_\_\_\_\_ No \_\_\_\_\_

D. Have you received any cost-sharing assistance from regulatory agencies to help offset regulatory capital investments? . . . . . Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, what percentage of the required investment did the cost-sharing account for? . . . . . Percent \_\_\_\_\_%

E. Please indicate the percentage of your farm/ranch operating costs that were directly related to regulatory compliance in 1999 and 2004.

1999	2004

If this percentage cannot be estimated, please leave blank. . . . .

F. Please check up to three regulatory compliance activities that have **most significantly increased your operating costs** over the past five years.

Regulatory Activities

(Check only 3.)

- Air Quality Compliance . . . . . \_\_\_\_\_
- Food Safety Regulations . . . . . \_\_\_\_\_
- Land Use Restricts . . . . . \_\_\_\_\_
- Occupational Hazards and Safety . . . . . \_\_\_\_\_
- Pesticide Application . . . . . \_\_\_\_\_
- Pesticide Registration . . . . . \_\_\_\_\_
- Solid and Hazardous Waste Disposal . . . . . \_\_\_\_\_
- Water Quality Compliance . . . . . \_\_\_\_\_
- Wildlife Protection . . . . . \_\_\_\_\_
- Workers' Compensation Insurance . . . . . \_\_\_\_\_
- None . . . . . \_\_\_\_\_
- Unsure . . . . . \_\_\_\_\_

G. A number of fees are charged by regulatory agencies. Please indicate the amount of money your farm/ranch has spent on monitoring fees and other permits associated with the regulatory areas listed below in 1999 and 2004.

If the information is not available, please leave blank.

- Regulatory Areas
- Air Quality . . . . . \_\_\_\_\_
  - Burning . . . . . \_\_\_\_\_
  - Chemical Use . . . . . \_\_\_\_\_
  - Solid Waste . . . . . \_\_\_\_\_
  - Water Quality . . . . . \_\_\_\_\_

Money Spent on Monitoring Fees and Permits (Dollars)	
1999	2004

H. Please indicate the amount of workers' compensation expenses you incurred in 1999 and 2004. If the information is not available, please leave blank.

Workers' Compensation Cost (Dollars per non-family employee)	
1999	2004

#### IV. Technological Choice

A. Has the California regulatory environment restricted your production technology choices? (Check only 1.)

Not Restricted . . . . . \_\_\_\_\_

Somewhat Restricted . . . . . \_\_\_\_\_

Severely Restricted . . . . . \_\_\_\_\_

B. Have delays in pesticide regulation impacted your farm/ranch operations? (Check only 1.)

No Impact . . . . . \_\_\_\_\_

Positive Impact . . . . . \_\_\_\_\_

Negative Impact . . . . . \_\_\_\_\_

#### V. Managerial Issues

A. What percentage of your managerial time was spent handling regulatory issues (written/verbal communication with regulatory agencies, obtaining permits, completing paperwork, etc.) in 1999 and 2004? . . . . . Percent

1999	2004

B. Does complexity of the regulatory environment significantly affect your ability to effectively manage your farm/ranch? . . . . . Yes \_\_\_\_\_ No \_\_\_\_\_

C. A potential risk associated with the regulatory environment is litigation risk.

Please indicate the level of risk associated with litigation. (Check only 1 box.)

No Risk . . . . . \_\_\_\_\_

Low Risk . . . . . \_\_\_\_\_

High Risk . . . . . \_\_\_\_\_

D. Over the past five years, have you found a greater need to consult with an attorney or other consultants concerning regulatory compliance of your farm/ranch? . . . . . Yes \_\_\_\_\_ No \_\_\_\_\_

E. The regulatory environment could potentially result in you having less flexibility in operational decision-making, and/or reductions in the number of crops or types of crop rotations that could be grown on your farm/ranch, and/or restrictions placed on land use.

Please indicate whether you think the regulatory environment **has reduced** your management options listed below.

##### Management Options

Choice of production inputs . . . . . Yes \_\_\_\_\_ No \_\_\_\_\_

Flexibility in operational decision-making . . . . . Yes \_\_\_\_\_ No \_\_\_\_\_

Number of crops that can be grown . . . . . Yes \_\_\_\_\_ No \_\_\_\_\_

Land use choices . . . . . Yes \_\_\_\_\_ No \_\_\_\_\_

F. Have you produced agricultural products in other states or countries? . . . Yes \_\_\_\_\_ No \_\_\_\_\_

If yes, please list where.

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If yes, did you find the regulatory environment more restrictive, less restrictive, or comparable to California's? *(Check only 1 box.)*

Less Restrictive . . . . . \_\_\_\_\_  
Comparable . . . . . \_\_\_\_\_  
More Restrictive . . . . . \_\_\_\_\_

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G. Have you considered any of the following due to the California regulatory environment?

Moving your agricultural operations out of California to another state or country . . . . . Yes \_\_\_\_\_ No \_\_\_\_\_  
Increasing the size of your agricultural operation . . . . . Yes \_\_\_\_\_ No \_\_\_\_\_  
Reducing the size of your agricultural operation . . . . . Yes \_\_\_\_\_ No \_\_\_\_\_  
Leaving agricultural production all together . . . . . Yes \_\_\_\_\_ No \_\_\_\_\_

**OPTIONAL:** If you have found duplication of effort among regulatory agencies, please provide an example. Additionally, please comment on any aspect of the California regulatory environment not covered by this survey.

**Thank you for your participation!**



## **Appendix C: Industries Represented in the Producers' Survey**

**Table C-1: Categorization of Industries and Industries Represented in Producer’s Survey**

<b>Industry</b>	<b>Number Represented in Survey</b>	<b>Industry</b>	<b>Number Represented in Survey</b>
<b>Fruit-Citrus</b>		<b>Vegetables-Leafy</b>	
Tangelos	1	Cabbage; fresh	1
Citrus; other	4	Cilantro	1
Mandarins	7	Cucumbers for pickles; processed	1
Tangerines	8	Kale	1
Limes	9	Lettuce; head	1
Grapefruit	19	Lettuce; romaine	1
Lemons	29	Spinach; fresh	2
Oranges; Valencia	39	Cauliflower	3
Oranges; Other than Valencia	74	Broccoli	4
		Lettuce; other	7
<b>Tree Nuts</b>		Herbs; fresh	5
Chestnuts	2		
Pecans	3	<b>Vegetables-Roots</b>	
Macadamia nuts	4	Beets	1
Pistachios	13	Garlic	1
Walnuts	104	Onions; dry	1
Almonds	118	Onions; green	1
		Carrots	2
<b>Berries</b>		Sugarbeets for sugar	2
Blackberries	1	Sweet potatoes	2
Berries; all other	2	Potatoes	4
Raspberries	4	Leeks	1
Blueberries; tame	6		
Strawberries	10	<b>Vegetables-Vines</b>	
		Okra	1
<b>Grapes</b>		Chinese peas; sugar; snow	2
Currants	1	Cucumbers; fresh	2
Grapes; dry	51	Peppers; other	2
Grapes; fresh	195	Squash; winter	2
		Tomatoes; processed	3
<b>Timber</b>		Pumpkins	4
Timber/Trees/Woodland/Wood (except holiday trees & nursery)	19	Squash; summer	4
		Beans; dry edible	6
		Peppers; bell	6
		Tomatoes; fresh	12

**Table C-1 Cont.: Categorization of Industries and Industries Represented in Producer's Survey**

<b>Industry</b>	<b>Number Represented in Survey</b>	<b>Industry</b>	<b>Number Represented in Survey</b>
<b>Horticulture</b>		<b>Fruit-Melons</b>	
Bedding/garden plants	1	Melons; miscellaneous	1
Horticultural specialties	1	Watermelons	2
Potted flowering plants	1	Cantaloupe	1
Horticulture; other	3		
Holiday trees	7	<b>Fruit-Stone</b>	
Nursery crops	8	Nectarines	10
Flowers; cut and cut florist greens	19	Apricots	11
Loquats	1	Cherries; sweet	15
		Prunes	15
		Plums	19
<b>Vegetables-other</b>		Peaches	23
Indian corn	1		
Sweet corn; fresh	3		
Vegetables; other	9	<b>Aquaculture</b>	
Watercress	1	Aquaculture; All other	1
Artichokes	1	Sport or Game Fish	1
		Fish; Other	1
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>			
		Sponges	1
Bermuda grass seed	1	Catfish	2
Grass silage	1		
Forage and greenchop	1	<b>Fruit-Other</b>	
Sorghum-sudan crosses	1	Guava	2
Hay; wild	2	Kumquats	2
Sod/turfgrass	2	Noncitrus fruits; other	2
Wheat; all; for seed	2	Dates	3
Cotton; pima	4	Kiwifruit	11
Alfalfa seed	5	Olives	31
Barley; grain for feed	5	Avocados	122
Corn; grain	5		
Silage & haylage (except corn & sorghum)	6	<b>Cattle, Hogs, and Dairy</b>	
		Cattle; Dairy herd replacements	2
Hay; small grain	7	Feeder Cattle	10
Cotton; upland	9	Milk and Dairy Products	18
Corn; silage	15	Cattle; all other	290
Grasses; other than clover & sudan	19	Cattle for Breeding Stock	3
Hay; alfalfa and alfalfa mixtures	51	Buffalo or Bison	1
Hay; other	59	Hogs; Farrow to Finish	2
		Other hogs and pigs	12

**Table C-1 Cont.: Categorization of Industries and Industries Represented in Producer's Survey**

<b>Industry</b>	<b>Number Represented in Survey</b>	<b>Industry</b>	<b>Number Represented in Survey</b>
<b>Grass, Grains, Seeds, and Fiber-Human</b>		<b>Horses</b>	
Peppermint	1	Mules; burros; donkeys	3
Rice; wild	1	Llama	4
Rye	1	Horses and ponies	75
Sugarcane for sugar	1		
Wheat; other spring	2	<b>Poultry</b>	
Oats	9	Geese	1
Rice	11	Pigeons	1
Wheat; winter	12	Poultry; other	1
Sunflower Seed; Non-Oil Variety	1	Chicken pullets; laying flock	1
Safflower	2	Turkey poults; meat type	1
		Turkeys; other	1
<b>Fruit-Deciduous</b>		Ducks	1
Figs	5	Game birds	1
Pears	8	Chickens; other meat type	3
Apples	33	OTHER Eggs; table market	15
Pomegranates	6		
Persimmons	14		
Cherimoyas	4		
<b>Other Animals &amp; Insects</b>			
Livestock; other fur bearing	1		
Rabbits	3		
Wool	5		
Bees	8		
Honey	9		
Lambs	12		
Goats	27		
Sheep; except lambs	33		

**Appendix D: Counties Broken-Up By Agricultural Regions of the State**

**Table D-1: Counties Broken-Up By Agricultural Regions of the State**

<b>Region 1: North Coast</b>	<b>Region 2: North Mountain</b>	<b>Region 3: Northeast Mountain</b>
Del Norte	Shasta	Lassen
Humboldt	Siskiyou	Modoc
Mendocino	Trinity	Plumas
<b>Region 4: Central Coast</b>	<b>Region 5: Sacramento Valley</b>	<b>Region 6: San Joaquin Valley</b>
Alameda	Butte	Fresno
Contra Costa	Colusa	Kern
Lake	Glenn	Kings
Marin	Sacramento	Madera
Monterey	Solano	Merced
Napa	Sutter	San Joaquin
San Benito	Tehama	Stanislaus
San Francisco	Yolo	Tulare
San Luis Obispo	Yuba	
San Mateo		
Santa Clara		
Santa Cruz		
Sonoma		
<b>Region 7: Sierra Nevada</b>	<b>Region 8: South Coast</b>	<b>Region 9: South Desert</b>
Alpine	Los Angeles	Imperial
Amador	Orange	Riverside
Calaveras	San Diego	San Bernardino
El Dorado	Santa Barbara	
Inyo	Ventura	
Mariposa		
Mono		
Nevada		
Placer		
Sierra		
Tuolumne		

**Appendix E: Complexity of Regulations by Industry, Region, and  
Income**

**Table E-1: Complexity of Regulatory Environment by Industry**

<b>Industry</b>	<b>Total Respondents</b>	<b>Not Complex</b>	<b>Somewhat Complex</b>	<b>Complex</b>	<b>Very Complex</b>
<b>Aquaculture</b>	3	0.00%	0.00%	100.00%	0.00%
<b>Fruit-Deciduous</b>	58	22.41%	39.66%	24.14%	13.79%
<b>Horses</b>	66	37.88%	30.30%	15.15%	16.67%
<b>Fruit-Other</b>	156	25.64%	35.90%	21.15%	17.31%
<b>Cattle, Hogs, and Dairy</b>	288	35.42%	25.69%	18.06%	20.83%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	33	21.21%	30.30%	27.27%	21.21%
<b>Vegetables-Other</b>	14	50.00%	7.14%	21.43%	21.43%
<b>Other Animals &amp; Insects</b>	70	35.71%	28.57%	12.86%	22.86%
<b>Horticulture</b>	39	20.51%	30.77%	25.64%	23.08%
<b>Vegetables-Roots</b>	13	23.08%	23.08%	30.77%	23.08%
<b>Grapes</b>	229	13.97%	34.50%	27.95%	23.58%
<b>Fruit-Citrus</b>	129	24.81%	31.01%	18.60%	25.58%
<b>Tree Nuts</b>	208	15.38%	26.44%	32.21%	25.96%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	132	20.45%	25.76%	25.76%	28.03%
<b>Timber</b>	17	35.29%	11.76%	23.53%	29.41%
<b>Vegetables-Vines</b>	34	29.41%	29.41%	11.76%	29.41%
<b>Poultry</b>	20	15.00%	15.00%	40.00%	30.00%
<b>Vegetables-Leafy</b>	15	26.67%	20.00%	20.00%	33.33%
<b>Fruit-Stone</b>	67	8.96%	20.90%	31.34%	38.81%
<b>Berries</b>	17	17.65%	11.76%	29.41%	41.18%
<b>Fruit-Melons</b>	4	0.00%	0.00%	25.00%	75.00%

**Table E-2: Complexity of Regulatory Environment by Region**

<b>Region</b>	<b>Total Respondents</b>	<b>Not Complex</b>	<b>Somewhat Complex</b>	<b>Complex</b>	<b>Very Complex</b>
<b>Sierra Nevada</b>	82	30.49%	32.93%	23.17%	13.41%
<b>South Desert</b>	69	40.58%	36.23%	8.70%	14.49%
<b>Northeast Mountain</b>	13	7.69%	46.15%	30.77%	15.38%
<b>North Mountain</b>	34	26.47%	41.18%	14.71%	17.65%
<b>South Coast</b>	177	31.07%	31.64%	18.64%	18.64%
<b>Central Coast</b>	248	29.84%	28.23%	22.58%	19.35%
<b>North Coast</b>	35	25.71%	34.29%	17.14%	22.86%
<b>San Joaquin Valley</b>	394	21.57%	28.93%	24.87%	24.62%
<b>Sacramento Valley</b>	142	17.61%	22.54%	32.39%	27.46%



**Table E-3: Complexity of Regulatory Environment by Income**

<b>Total</b>	<b>Total Respondents</b>	<b>Not Complex</b>	<b>Somewhat Complex</b>	<b>Complex</b>	<b>Very Complex</b>
<b>Under \$10,000</b>	499	40.28%	28.66%	17.03%	14.03%
<b>\$10,000 to \$49,999</b>	301	25.25%	34.55%	21.93%	18.27%
<b>Average for all</b>	1163	25.71%	30.35%	22.96%	20.98%
<b>\$100,000 to \$249,999</b>	97	6.19%	38.14%	29.90%	25.77%
<b>\$50,000 to \$99,999</b>	124	8.87%	37.10%	26.61%	27.42%
<b>\$250,000 \$499,000</b>	39	2.56%	15.38%	46.15%	35.90%
<b>\$500,000 and Above</b>	103	3.88%	16.50%	34.95%	44.66%

**Appendix F: Impact of Regulatory Areas By Industry, Region, and  
Gross Income**

**Table F-1: Impact of Air Quality Regulatory Area By Industry**

<b>Industry</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Aquaculture</b>	3	66.67%	33.33%	0.00%
<b>Fruit-Other</b>	90	57.78%	21.11%	21.11%
<b>Vegetables-Other</b>	9	44.44%	33.33%	22.22%
<b>Poultry</b>	13	76.92%	0.00%	23.08%
<b>Vegetables-Leafy</b>	11	54.55%	18.18%	27.27%
<b>Berries</b>	14	57.14%	14.29%	28.57%
<b>Timber</b>	14	35.71%	35.71%	28.57%
<b>Other Animals &amp; Insects</b>	43	58.14%	11.63%	30.23%
<b>Horses</b>	45	53.33%	11.11%	35.56%
<b>Fruit-Citrus</b>	82	50.00%	13.41%	36.59%
<b>Horticulture</b>	27	51.85%	11.11%	37.04%
<b>Cattle, Hogs, and Dairy</b>	178	46.63%	16.29%	37.08%
<b>Fruit-Deciduous</b>	41	48.78%	12.20%	39.02%
<b>Grapes</b>	162	30.25%	25.31%	44.44%
<b>Vegetables-Roots</b>	9	33.33%	22.22%	44.44%
<b>Vegetables-Vines</b>	27	29.63%	22.22%	48.15%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	88	34.09%	15.91%	50.00%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	24	37.50%	12.50%	50.00%
<b>Tree Nuts</b>	148	13.51%	25.68%	60.81%
<b>Fruit-Stone</b>	52	23.08%	13.46%	63.46%
<b>Fruit-Melons</b>	3	0.00%	0.00%	100.00%

**Table F-2: Impact of Food Safety Regulatory Area By Industry**

<b>Industry</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Timber</b>	13	61.54%	38.46%	0.00%
<b>Vegetables-Roots</b>	9	55.56%	44.44%	0.00%
<b>Aquaculture</b>	3	100.00%	0.00%	0.00%
<b>Grapes</b>	147	58.50%	34.69%	6.80%
<b>Horses</b>	40	70.00%	22.50%	7.50%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	83	62.65%	28.92%	8.43%
<b>Cattle, Hogs, and Dairy</b>	166	61.45%	30.12%	8.43%
<b>Fruit-Other</b>	87	56.32%	34.48%	9.20%
<b>Fruit-Citrus</b>	76	63.16%	27.63%	9.21%
<b>Horticulture</b>	26	69.23%	19.23%	11.54%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	25	64.00%	24.00%	12.00%
<b>Other Animals &amp; Insects</b>	42	57.14%	28.57%	14.29%
<b>Vegetables-Vines</b>	27	40.74%	44.44%	14.81%
<b>Poultry</b>	13	61.54%	23.08%	15.38%
<b>Tree Nuts</b>	138	51.45%	30.43%	18.12%
<b>Vegetables-Other</b>	11	36.36%	45.45%	18.18%
<b>Vegetables-Leafy</b>	11	36.36%	45.45%	18.18%
<b>Fruit-Stone</b>	52	53.85%	26.92%	19.23%
<b>Fruit-Deciduous</b>	40	47.50%	32.50%	20.00%
<b>Berries</b>	14	28.57%	42.86%	28.57%
<b>Fruit-Melons</b>	3	0.00%	66.67%	33.33%

**Table F-3: Impact of Land Use Regulatory Area By Industry**

<b>Industry</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Vegetables-Leafy</b>	11	63.64%	18.18%	18.18%
<b>Fruit-Deciduous</b>	40	50.00%	20.00%	30.00%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	23	34.78%	34.78%	30.43%
<b>Fruit-Other</b>	90	41.11%	25.56%	33.33%
<b>Fruit-Stone</b>	53	35.85%	30.19%	33.96%
<b>Tree Nuts</b>	140	42.86%	21.43%	35.71%
<b>Other Animals &amp; Insects</b>	46	43.48%	19.57%	36.96%
<b>Fruit-Citrus</b>	78	34.62%	28.21%	37.18%
<b>Cattle, Hogs, and Dairy</b>	176	36.36%	23.86%	39.77%
<b>Vegetables-Other</b>	10	30.00%	30.00%	40.00%
<b>Grapes</b>	154	29.22%	27.92%	42.86%
<b>Vegetables-Vines</b>	28	32.14%	25.00%	42.86%
<b>Horses</b>	43	34.88%	20.93%	44.19%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	83	33.73%	21.69%	44.58%
<b>Horticulture</b>	26	42.31%	11.54%	46.15%
<b>Vegetables-Roots</b>	8	37.50%	12.50%	50.00%
<b>Berries</b>	14	21.43%	21.43%	57.14%
<b>Timber</b>	14	14.29%	28.57%	57.14%
<b>Poultry</b>	14	28.57%	7.14%	64.29%
<b>Aquaculture</b>	3	33.33%	0.00%	66.67%
<b>Fruit-Melons</b>	3	0.00%	0.00%	100.00%

**Table F-4: Impact of Occupational Safety and Hazards Regulatory Area By Industry**

<b>Industry</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Poultry</b>	13	76.92%	7.69%	15.38%
<b>Other Animals &amp; Insects</b>	40	75.00%	7.50%	17.50%
<b>Fruit-Other</b>	91	43.96%	38.46%	17.58%
<b>Horses</b>	39	61.54%	20.51%	17.95%
<b>Vegetables-Leafy</b>	11	54.55%	27.27%	18.18%
<b>Fruit-Deciduous</b>	39	58.97%	20.51%	20.51%
<b>Cattle, Hogs, and Dairy</b>	164	58.54%	18.90%	22.56%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	24	41.67%	33.33%	25.00%
<b>Fruit-Citrus</b>	77	44.16%	29.87%	25.97%
<b>Grapes</b>	153	40.52%	32.03%	27.45%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	85	48.24%	23.53%	28.24%
<b>Tree Nuts</b>	139	35.97%	33.81%	30.22%
<b>Vegetables-Other</b>	9	44.44%	22.22%	33.33%
<b>Fruit-Melons</b>	3	0.00%	66.67%	33.33%
<b>Aquaculture</b>	3	66.67%	0.00%	33.33%
<b>Vegetables-Vines</b>	26	42.31%	23.08%	34.62%
<b>Berries</b>	14	57.14%	7.14%	35.71%
<b>Timber</b>	13	46.15%	15.38%	38.46%
<b>Fruit-Stone</b>	51	29.41%	27.45%	43.14%
<b>Horticulture</b>	27	37.04%	14.81%	48.15%
<b>Vegetables-Roots</b>	7	28.57%	14.29%	57.14%

**Table F-5: Impact of Pesticide Application Regulatory Area By Industry**

<b>Total</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Other Animals &amp; Insects</b>	41	60.98%	19.51%	19.51%
<b>Vegetables-Leafy</b>	10	40.00%	40.00%	20.00%
<b>Vegetables-Vines</b>	27	22.22%	55.56%	22.22%
<b>Fruit-Deciduous</b>	43	32.56%	41.86%	25.58%
<b>Grapes</b>	165	21.21%	50.30%	28.48%
<b>Berries</b>	14	35.71%	35.71%	28.57%
<b>Vegetables-Other</b>	9	44.44%	22.22%	33.33%
<b>Fruit-Melons</b>	3	0.00%	66.67%	33.33%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	24	20.83%	45.83%	33.33%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	89	23.60%	41.57%	34.83%
<b>Fruit-Other</b>	93	23.66%	40.86%	35.48%
<b>Horticulture</b>	27	25.93%	37.04%	37.04%
<b>Fruit-Citrus</b>	78	19.23%	43.59%	37.18%
<b>Tree Nuts</b>	143	15.38%	40.56%	44.06%
<b>Timber</b>	13	53.85%	0.00%	46.15%
<b>Vegetables-Roots</b>	8	25.00%	25.00%	50.00%
<b>Fruit-Stone</b>	56	16.07%	30.36%	53.57%

**Table F-6: Impact of Pesticide Registration Regulatory Area By Industry**

<b>Industry</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Other Animals &amp; Insects</b>	40	60.00%	22.50%	17.50%
<b>Berries</b>	14	42.86%	35.71%	21.43%
<b>Vegetables-Vines</b>	27	22.22%	55.56%	22.22%
<b>Cattle, Hogs, and Dairy</b>	167	56.29%	19.16%	24.55%
<b>Vegetables-Roots</b>	8	25.00%	50.00%	25.00%
<b>Grapes</b>	157	24.20%	49.68%	26.11%
<b>Vegetables-Leafy</b>	11	45.45%	27.27%	27.27%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	86	32.56%	34.88%	32.56%
<b>Vegetables-Other</b>	9	33.33%	33.33%	33.33%
<b>Fruit-Melons</b>	3	0.00%	66.67%	33.33%
<b>Fruit-Other</b>	93	30.11%	35.48%	34.41%
<b>Horticulture</b>	26	34.62%	30.77%	34.62%
<b>Fruit-Deciduous</b>	42	28.57%	33.33%	38.10%
<b>Fruit-Citrus</b>	78	33.33%	26.92%	39.74%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	24	20.83%	37.50%	41.67%
<b>Timber</b>	13	46.15%	7.69%	46.15%
<b>Tree Nuts</b>	138	13.77%	39.86%	46.38%
<b>Fruit-Stone</b>	54	24.07%	24.07%	51.85%



**Table F-7: Impact of Wildlife Protection Regulatory Area By Industry**

<b>Industry</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Vegetables-Leafy</b>	11	63.64%	36.36%	0.00%
<b>Poultry</b>	13	76.92%	15.38%	7.69%
<b>Vegetables-Other</b>	10	40.00%	50.00%	10.00%
<b>Horticulture</b>	26	61.54%	23.08%	15.38%
<b>Fruit-Deciduous</b>	41	63.41%	19.51%	17.07%
<b>Fruit-Citrus</b>	77	67.53%	14.29%	18.18%
<b>Fruit-Other</b>	88	56.82%	22.73%	20.45%
<b>Horses</b>	38	50.00%	28.95%	21.05%
<b>Vegetables-Vines</b>	26	53.85%	23.08%	23.08%
<b>Vegetables-Roots</b>	8	50.00%	25.00%	25.00%
<b>Cattle, Hogs, and Dairy</b>	170	51.18%	22.94%	25.88%
<b>Tree Nuts</b>	136	55.15%	17.65%	27.21%
<b>Grapes</b>	147	49.66%	23.13%	27.21%
<b>Other Animals &amp; Insects</b>	40	50.00%	22.50%	27.50%
<b>Timber</b>	14	42.86%	28.57%	28.57%
<b>Aquaculture</b>	3	33.33%	33.33%	33.33%
<b>Fruit-Stone</b>	51	45.10%	19.61%	35.29%
<b>Berries</b>	14	35.71%	28.57%	35.71%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	83	38.55%	25.30%	36.14%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	23	26.09%	34.78%	39.13%
<b>Fruit-Melons</b>	2	0.00%	50.00%	50.00%

**Table F-8: Impact of Workers' Compensation Regulatory Area By Industry**

<b>Industry</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Other Animals &amp; Insects</b>	42	59.52%	4.76%	35.71%
<b>Horses</b>	43	53.49%	9.30%	37.21%
<b>Berries</b>	13	53.85%	7.69%	38.46%
<b>Fruit-Deciduous</b>	39	48.72%	12.82%	38.46%
<b>Fruit-Other</b>	91	41.76%	19.78%	38.46%
<b>Cattle, Hogs, and Dairy</b>	167	49.70%	8.98%	41.32%
<b>Fruit-Citrus</b>	75	42.67%	13.33%	44.00%
<b>Vegetables-Leafy</b>	9	33.33%	22.22%	44.44%
<b>Vegetables-Other</b>	11	36.36%	18.18%	45.45%
<b>Timber</b>	13	46.15%	7.69%	46.15%
<b>Poultry</b>	13	53.85%	0.00%	46.15%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	23	30.43%	21.74%	47.83%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	87	34.48%	17.24%	48.28%
<b>Grapes</b>	153	31.37%	16.99%	51.63%
<b>Vegetables-Vines</b>	27	29.63%	14.81%	55.56%
<b>Tree Nuts</b>	140	31.43%	12.14%	56.43%
<b>Horticulture</b>	27	25.93%	7.41%	66.67%
<b>Fruit-Stone</b>	54	12.96%	12.96%	74.07%
<b>Vegetables-Roots</b>	7	0.00%	14.29%	85.71%
<b>Fruit-Melons</b>	3	0.00%	0.00%	100.00%
<b>Aquaculture</b>	3	0.00%	0.00%	100.00%

**Table F-9: Impact of Solid and Hazardous Waste Disposal Regulatory Area By Industry**

<b>Industry</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Vegetables-Roots</b>	7	85.71%	0.00%	14.29%
<b>Vegetables-Leafy</b>	11	54.55%	27.27%	18.18%
<b>Vegetables-Vines</b>	26	50.00%	30.77%	19.23%
<b>Fruit-Other</b>	87	51.72%	27.59%	20.69%
<b>Fruit-Deciduous</b>	37	62.16%	16.22%	21.62%
<b>Vegetables-Other</b>	9	55.56%	22.22%	22.22%
<b>Fruit-Citrus</b>	78	53.85%	20.51%	25.64%
<b>Other Animals &amp; Insects</b>	40	60.00%	12.50%	27.50%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	24	29.17%	41.67%	29.17%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	86	39.53%	27.91%	32.56%
<b>Aquaculture</b>	3	66.67%	0.00%	33.33%
<b>Cattle, Hogs, and Dairy</b>	169	50.89%	14.79%	34.32%
<b>Berries</b>	14	42.86%	21.43%	35.71%
<b>Horses</b>	39	46.15%	17.95%	35.90%
<b>Poultry</b>	13	53.85%	7.69%	38.46%
<b>Grapes</b>	153	33.99%	27.45%	38.56%
<b>Tree Nuts</b>	136	38.24%	21.32%	40.44%
<b>Horticulture</b>	26	42.31%	15.38%	42.31%
<b>Fruit-Stone</b>	51	39.22%	17.65%	43.14%
<b>Timber</b>	13	23.08%	15.38%	61.54%
<b>Fruit-Melons</b>	3	0.00%	33.33%	66.67%

**Table F-10: Impact of Water Quality Regulatory Area By Industry**

<b>Industry</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
Vegetables-Leafy	11	45.45%	36.36%	18.18%
Fruit-Other	91	49.45%	29.67%	20.88%
Fruit-Citrus	78	53.85%	21.79%	24.36%
Other Animals & Insects	41	60.98%	14.63%	24.39%
Horticulture	27	51.85%	18.52%	29.63%
Poultry	13	69.23%	0.00%	30.77%
Fruit-Deciduous	42	57.14%	11.90%	30.95%
Horses	42	33.33%	35.71%	30.95%
Aquaculture	3	66.67%	0.00%	33.33%
Berries	14	35.71%	28.57%	35.71%
Vegetables-Other	10	20.00%	40.00%	40.00%
Grapes	152	28.95%	30.92%	40.13%
Cattle, Hogs, and Dairy	176	35.80%	23.86%	40.34%
Vegetables-Roots	7	28.57%	28.57%	42.86%
Vegetables-Vines	26	15.38%	38.46%	46.15%
Tree Nuts	144	28.47%	23.61%	47.92%
Grass, Grains, Seeds, and Fiber-Nonhuman	85	21.18%	27.06%	51.76%
Fruit-Stone	54	25.93%	22.22%	51.85%
Grass, Grains, Seeds, and Fiber-Human	22	9.09%	36.36%	54.55%
Timber	16	12.50%	25.00%	62.50%
Fruit-Melons	3	0.00%	0.00%	100.00%

**Table F-11: Impact of Air Quality Regulatory Area By Region of the State**

<b>Region</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
South Coast	108	66.67%	13.89%	19.44%
Northeast Mountain	5	80.00%	0.00%	20.00%
South Desert	45	68.89%	6.67%	24.44%
Central Coast	165	50.30%	23.03%	26.67%
Sierra Nevada	50	54.00%	16.00%	30.00%
North Mountain	18	55.56%	11.11%	33.33%
North Coast	24	37.50%	25.00%	37.50%
San Joaquin Valley	271	19.93%	22.51%	57.56%
Sacramento Valley	99	24.24%	15.15%	60.61%

**Table F-12: Impact of Food Safety Regulatory Area By Region of the State**

<b>Region</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>South Desert</b>	43	65.12%	30.23%	4.65%
<b>North Mountain</b>	17	76.47%	17.65%	5.88%
<b>Sierra Nevada</b>	49	65.31%	28.57%	6.12%
<b>Central Coast</b>	155	63.87%	27.10%	9.03%
<b>San Joaquin Valley</b>	246	51.63%	36.99%	11.38%
<b>South Coast</b>	104	63.46%	25.00%	11.54%
<b>Sacramento Valley</b>	97	56.70%	28.87%	14.43%
<b>Northeast Mountain</b>	5	80.00%	0.00%	20.00%
<b>North Coast</b>	23	34.78%	39.13%	26.09%

**Table F-13: Impact of Land Use Regulatory Area By Region of the State**

<b>Region</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Northeast Mountain</b>	6	66.67%	16.67%	16.67%
<b>South Desert</b>	42	52.38%	16.67%	30.95%
<b>Sierra Nevada</b>	54	42.59%	24.07%	33.33%
<b>San Joaquin Valley</b>	248	42.74%	23.79%	33.47%
<b>North Coast</b>	24	33.33%	29.17%	37.50%
<b>Central Coast</b>	164	32.32%	27.44%	40.24%
<b>South Coast</b>	109	37.61%	20.18%	42.20%
<b>Sacramento Valley</b>	98	34.69%	20.41%	44.90%
<b>North Mountain</b>	19	42.11%	10.53%	47.37%

**Table F-14: Impact of Occupational Safety and Hazards Regulatory Area By Region of the State**

<b>Total</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>South Desert</b>	42	59.52%	28.57%	11.90%
<b>Sierra Nevada</b>	46	73.91%	10.87%	15.22%
<b>North Coast</b>	22	59.09%	22.73%	18.18%
<b>North Mountain</b>	16	81.25%	0.00%	18.75%
<b>Central Coast</b>	159	51.57%	27.04%	21.38%
<b>South Coast</b>	108	55.56%	22.22%	22.22%
<b>Northeast Mountain</b>	7	71.43%	0.00%	28.57%
<b>San Joaquin Valley</b>	249	38.15%	30.12%	31.73%
<b>Sacramento Valley</b>	97	38.14%	26.80%	35.05%

**Table F-15: Impact of Pesticide Application Regulatory Area By Region of the State**

<b>Region</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Sierra Nevada</b>	48	54.17%	27.08%	18.75%
<b>South Desert</b>	42	42.86%	38.10%	19.05%
<b>Northeast Mountain</b>	5	40.00%	40.00%	20.00%
<b>North Mountain</b>	17	58.82%	17.65%	23.53%
<b>Central Coast</b>	165	34.55%	41.82%	23.64%
<b>South Coast</b>	108	33.33%	35.19%	31.48%
<b>North Coast</b>	22	59.09%	9.09%	31.82%
<b>San Joaquin Valley</b>	264	19.70%	40.15%	40.15%
<b>Sacramento Valley</b>	100	23.00%	35.00%	42.00%

**Table F-16: Impact of Pesticide Registration Regulatory Area By Region of the State**

<b>Region</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Northeast Mountain</b>	5	60.00%	40.00%	0.00%
<b>South Desert</b>	42	64.29%	19.05%	16.67%
<b>North Mountain</b>	16	75.00%	6.25%	18.75%
<b>Central Coast</b>	164	40.24%	37.80%	21.95%
<b>Sierra Nevada</b>	48	52.08%	25.00%	22.92%
<b>South Coast</b>	107	37.38%	30.84%	31.78%
<b>North Coast</b>	22	59.09%	9.09%	31.82%
<b>San Joaquin Valley</b>	255	23.53%	38.82%	37.65%
<b>Sacramento Valley</b>	97	25.77%	29.90%	44.33%

**Table F-17: Impact of Wildlife Protection Regulatory Area By Region of the State**

<b>Region</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Sierra Nevada</b>	44	70.45%	15.91%	13.64%
<b>Northeast Mountain</b>	6	50.00%	33.33%	16.67%
<b>South Coast</b>	105	60.00%	20.95%	19.05%
<b>Central Coast</b>	161	52.80%	24.84%	22.36%
<b>South Desert</b>	42	59.52%	14.29%	26.19%
<b>San Joaquin Valley</b>	245	52.24%	20.41%	27.35%
<b>Sacramento Valley</b>	96	45.83%	20.83%	33.33%
<b>North Coast</b>	23	43.48%	21.74%	34.78%
<b>North Mountain</b>	18	38.89%	16.67%	44.44%

**Table F-18: Impact of Workers' Compensation Regulatory Area By Region of the State**

<b>Region</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Sierra Nevada</b>	49	61.22%	8.16%	30.61%
<b>North Mountain</b>	18	61.11%	5.56%	33.33%
<b>South Desert</b>	42	59.52%	4.76%	35.71%
<b>Central Coast</b>	160	43.75%	16.88%	39.38%
<b>South Coast</b>	106	49.06%	11.32%	39.62%
<b>North Coast</b>	24	45.83%	8.33%	45.83%
<b>San Joaquin Valley</b>	254	31.10%	16.14%	52.76%
<b>Northeast Mountain</b>	7	28.57%	14.29%	57.14%
<b>Sacramento Valley</b>	94	27.66%	8.51%	63.83%

**Table F-19: Impact of Solid and Hazardous Waste Disposal Regulatory Area By Region of the State**

<b>Region</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Northeast Mountain</b>	5	80.00%	20.00%	0.00%
<b>South Desert</b>	45	57.78%	24.44%	17.78%
<b>South Coast</b>	101	52.48%	22.77%	24.75%
<b>Central Coast</b>	162	48.15%	21.60%	30.25%
<b>Sierra Nevada</b>	45	57.78%	8.89%	33.33%
<b>North Mountain</b>	17	52.94%	11.76%	35.29%
<b>San Joaquin Valley</b>	247	38.46%	25.91%	35.63%
<b>North Coast</b>	22	50.00%	13.64%	36.36%
<b>Sacramento Valley</b>	99	41.41%	18.18%	40.40%



**Table F-20: Impact of Water Quality Regulatory Area By Region of the State**

<b>Region</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>South Coast</b>	106	52.83%	23.58%	23.58%
<b>South Desert</b>	42	47.62%	26.19%	26.19%
<b>Sierra Nevada</b>	49	53.06%	18.37%	28.57%
<b>Central Coast</b>	160	38.75%	29.38%	31.88%
<b>North Mountain</b>	20	35.00%	30.00%	35.00%
<b>Northeast Mountain</b>	5	60.00%	0.00%	40.00%
<b>San Joaquin Valley</b>	255	28.63%	29.02%	42.35%
<b>North Coast</b>	26	30.77%	19.23%	50.00%
<b>Sacramento Valley</b>	100	27.00%	21.00%	52.00%

**Table F-21: Impact of Air Quality Regulatory Area By Gross Income**

<b>Income Category</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Under \$10,000</b>	304	56.91%	17.11%	25.99%
<b>\$10,000 to \$49,999</b>	194	38.14%	22.16%	39.69%
<b>\$100,000 to \$249,999</b>	71	28.17%	21.13%	50.70%
<b>\$50,000 to \$99,999</b>	85	24.71%	20.00%	55.29%
<b>\$250,000 \$499,000</b>	32	21.88%	18.75%	59.38%
<b>\$500,000 and Above</b>	87	20.69%	13.79%	65.52%

**Table F-22: Impact of Food Safety Regulatory Area By Gross Income**

<b>Income Category</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Under \$10,000</b>	283	69.26%	23.67%	7.07%
<b>\$50,000 to \$99,999</b>	82	50.00%	39.02%	10.98%
<b>\$10,000 to \$49,999</b>	181	59.12%	29.28%	11.60%
<b>\$100,000 to \$249,999</b>	67	50.75%	35.82%	13.43%
<b>\$250,000 \$499,000</b>	32	59.38%	25.00%	15.63%
<b>\$500,000 and Above</b>	84	38.10%	44.05%	17.86%

**Table F-23: Impact of Land Use Regulatory Area By Gross Income**

<b>Income Category</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Under \$10,000</b>	294	47.96%	21.77%	30.27%
<b>\$10,000 to \$49,999</b>	191	38.22%	23.56%	38.22%
<b>\$100,000 to \$249,999</b>	69	39.13%	20.29%	40.58%
<b>\$50,000 to \$99,999</b>	85	27.06%	29.41%	43.53%
<b>\$250,000 \$499,000</b>	32	21.88%	31.25%	46.88%
<b>\$500,000 and Above</b>	82	30.49%	19.51%	50.00%

**Table F-24: Impact of Occupational Safety and Hazards Regulatory Area By Gross Income**

<b>Income Category</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Under \$10,000</b>	279	67.74%	20.07%	12.19%
<b>\$10,000 to \$49,999</b>	736	49.18%	25.68%	25.14%
<b>\$100,000 to \$249,999</b>	84	33.33%	32.14%	34.52%
<b>\$50,000 to \$99,999</b>	71	30.99%	32.39%	36.62%
<b>\$250,000 \$499,000</b>	33	30.30%	27.27%	42.42%
<b>\$500,000 and Above</b>	82	20.73%	29.27%	50.00%

**Table F-25: Impact of Pesticide Application Regulatory Area By Gross Income**

<b>Income Category</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Under \$10,000</b>	288	45.49%	32.64%	21.88%
<b>\$10,000 to \$49,999</b>	193	24.35%	39.38%	36.27%
<b>\$100,000 to \$249,999</b>	87	19.54%	43.68%	36.78%
<b>\$50,000 to \$99,999</b>	73	24.66%	36.99%	38.36%
<b>\$250,000 \$499,000</b>	87	19.54%	37.93%	42.53%
<b>\$500,000 and Above</b>	33	18.18%	36.36%	45.45%

**Table F-26: Impact of Pesticide Registration Regulatory Area By Gross Income**

<b>Income Category</b>	<b>Total Respondents</b>	<b>No Impact</b>	<b>Positive Impact</b>	<b>Negative Impact</b>
<b>Under \$10,000</b>	289	52.25%	26.99%	20.76%
<b>\$10,000 to \$49,999</b>	190	27.89%	40.53%	31.58%
<b>\$100,000 to \$249,999</b>	32	31.25%	34.38%	34.38%
<b>\$50,000 to \$99,999</b>	69	24.64%	36.23%	39.13%
<b>\$250,000 \$499,000</b>	82	24.39%	32.93%	42.68%
<b>\$500,000 and Above</b>	84	22.62%	32.14%	45.24%

**Table F-27: Impact of Wildlife Protection Regulatory Area By Gross Income**

Income Category	Total Respondents	Wildlife Protection Regulatory Area		
		No Impact	Positive Impact	Negative Impact
Under \$10,000	282	64.54%	20.21%	15.25%
\$10,000 to \$49,999	186	55.38%	24.73%	19.89%
\$250,000 \$499,000	32	40.63%	28.13%	31.25%
\$50,000 to \$99,999	79	44.30%	21.52%	34.18%
\$100,000 to \$249,999	69	37.68%	17.39%	44.93%
\$500,000 and Above	82	40.24%	13.41%	46.34%

**Table F-28: Impact of Workers' Compensation Regulatory Area By Gross Income**

Income Category	Total Respondents	Workers' Compensation Regulatory Area		
		No Impact	Positive Impact	Negative Impact
Under \$10,000	282	68.79%	9.57%	21.63%
\$10,000 to \$49,999	183	39.34%	16.94%	43.72%
\$50,000 to \$99,999	87	14.94%	20.69%	64.37%
\$100,000 to \$249,999	74	21.62%	13.51%	64.86%
\$250,000 \$499,000	34	11.76%	14.71%	73.53%
\$500,000 and Above	84	4.76%	7.14%	88.10%

**Table F-29: Impact of Solid and Hazardous Waste Disposal Regulatory Area By Gross Income**

Income Category	Total Respondents	Solid and Hazardous Waste Disposal Regulatory Area		
		No Impact	Positive Impact	Negative Impact
Under \$10,000	281	58.01%	17.44%	24.56%
\$50,000 to \$99,999	80	40.00%	31.25%	28.75%
\$10,000 to \$49,999	186	45.16%	25.81%	29.03%
\$100,000 to \$249,999	70	34.29%	20.00%	45.71%
\$250,000 \$499,000	33	30.30%	21.21%	48.48%
\$500,000 and Above	82	30.49%	19.51%	50.00%

**Table F-30: Impact of Water Quality Regulatory Area By Gross Income**

Income Category	Total Respondents	Water Quality Regulatory Area		
		No Impact	Positive Impact	Negative Impact
Under \$10,000	287	51.92%	24.04%	24.04%
\$10,000 to \$49,999	191	37.17%	27.23%	35.60%
\$50,000 to \$99,999	86	24.42%	36.05%	39.53%
\$100,000 to \$249,999	71	29.58%	22.54%	47.89%
\$250,000 \$499,000	32	25.00%	18.75%	56.25%
\$500,000 and Above	85	12.94%	23.53%	63.53%

**Appendix G: Top Three Areas Increasing Operating Costs By  
Industry, Region, and Gross Income**

**Table G-1: Top Three Areas Increasing Operating Costs: Air Quality Compliance**

<b>Industry</b>	<b>Total Respondents</b>	<b>No</b>	<b>Yes</b>
<b>Vegetables-Other</b>	12	100.00%	0.00%
<b>Aquaculture</b>	3	100.00%	0.00%
<b>Vegetables-Leafy</b>	12	91.67%	8.33%
<b>Fruit-Other</b>	134	90.30%	9.70%
<b>Poultry</b>	19	89.47%	10.53%
<b>Other Animals &amp; Insects</b>	58	87.93%	12.07%
<b>Fruit-Citrus</b>	111	86.49%	13.51%
<b>Horticulture</b>	33	84.85%	15.15%
<b>Berries</b>	13	84.62%	15.38%
<b>Horses</b>	55	83.64%	16.36%
<b>Vegetables-Vines</b>	30	83.33%	16.67%
<b>Cattle, Hogs, and Dairy</b>	251	81.27%	18.73%
<b>Fruit-Deciduous</b>	54	77.78%	22.22%
<b>Timber</b>	17	76.47%	23.53%
<b>Grapes</b>	195	72.31%	27.69%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	120	68.33%	31.67%
<b>Vegetables-Roots</b>	8	62.50%	37.50%
<b>Fruit-Stone</b>	60	51.67%	48.33%
<b>Tree Nuts</b>	188	50.00%	50.00%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	30	50.00%	50.00%
<b>Fruit-Melons</b>	3	33.33%	66.67%

**Table G-2: Top Three Areas Increasing Operating Costs: Food Safety Regulations**

<b>Industry</b>	<b>Total Respondents</b>	<b>No</b>	<b>Yes</b>
<b>Fruit-Melons</b>	3	100.00%	0.00%
<b>Aquaculture</b>	3	100.00%	0.00%
<b>Horses</b>	55	100.00%	0.00%
<b>Horticulture</b>	33	96.97%	3.03%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	120	96.67%	3.33%
<b>Grapes</b>	195	94.87%	5.13%
<b>Fruit-Citrus</b>	111	94.59%	5.41%
<b>Timber</b>	17	94.12%	5.88%
<b>Fruit-Other</b>	134	94.03%	5.97%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	30	93.33%	6.67%
<b>Cattle, Hogs, and Dairy</b>	251	93.23%	6.77%
<b>Tree Nuts</b>	188	93.09%	6.91%
<b>Fruit-Deciduous</b>	54	90.74%	9.26%
<b>Vegetables-Vines</b>	30	90.00%	10.00%
<b>Fruit-Stone</b>	60	88.33%	11.67%
<b>Other Animals &amp; Insects</b>	58	87.93%	12.07%
<b>Vegetables-Roots</b>	8	87.50%	12.50%
<b>Vegetables-Leafy</b>	12	83.33%	16.67%
<b>Poultry</b>	19	78.95%	21.05%
<b>Berries</b>	13	76.92%	23.08%
<b>Vegetables-Other</b>	12	75.00%	25.00%

**Table G-3: Top Three Areas Increasing Operating Costs: Land Use Restrictions**

<b>Industry</b>	<b>Total Respondents</b>	<b>No</b>	<b>Yes</b>
<b>Vegetables-Roots</b>	8	100.00%	0.00%
<b>Fruit-Melons</b>	3	100.00%	0.00%
<b>Tree Nuts</b>	188	91.49%	8.51%
<b>Other Animals &amp; Insects</b>	58	87.93%	12.07%
<b>Fruit-Stone</b>	60	86.67%	13.33%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	30	86.67%	13.33%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	120	85.83%	14.17%
<b>Vegetables-Leafy</b>	12	83.33%	16.67%
<b>Vegetables-Vines</b>	30	83.33%	16.67%
<b>Fruit-Citrus</b>	111	82.88%	17.12%
<b>Fruit-Deciduous</b>	54	81.48%	18.52%
<b>Fruit-Other</b>	134	80.60%	19.40%
<b>Grapes</b>	195	80.00%	20.00%
<b>Cattle, Hogs, and Dairy</b>	251	76.10%	23.90%
<b>Horticulture</b>	33	75.76%	24.24%
<b>Horses</b>	55	67.27%	32.73%
<b>Aquaculture</b>	3	66.67%	33.33%
<b>Poultry</b>	19	63.16%	36.84%
<b>Berries</b>	13	61.54%	38.46%
<b>Vegetables-Other</b>	12	58.33%	41.67%
<b>Timber</b>	17	52.94%	47.06%

**Table G-4: Top Three Areas Increasing Operating Costs: None**

<b>Industry</b>	<b>Total Respondents</b>	<b>No</b>	<b>Yes</b>
<b>Fruit-Melons</b>	3	100.00%	0.00%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	30	100.00%	0.00%
<b>Aquaculture</b>	3	100.00%	0.00%
<b>Fruit-Stone</b>	60	95.00%	5.00%
<b>Grapes</b>	195	92.82%	7.18%
<b>Berries</b>	13	92.31%	7.69%
<b>Vegetables-Other</b>	12	91.67%	8.33%
<b>Tree Nuts</b>	188	89.89%	10.11%
<b>Timber</b>	17	88.24%	11.76%
<b>Vegetables-Roots</b>	8	87.50%	12.50%
<b>Vegetables-Vines</b>	30	86.67%	13.33%
<b>Fruit-Deciduous</b>	54	85.19%	14.81%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	120	84.17%	15.83%
<b>Fruit-Citrus</b>	111	83.78%	16.22%
<b>Fruit-Other</b>	134	82.84%	17.16%
<b>Horticulture</b>	33	81.82%	18.18%
<b>Poultry</b>	19	78.95%	21.05%
<b>Horses</b>	55	78.18%	21.82%
<b>Cattle, Hogs, and Dairy</b>	251	77.69%	22.31%
<b>Vegetables-Leafy</b>	12	75.00%	25.00%
<b>Other Animals &amp; Insects</b>	58	68.97%	31.03%



**Table G-5: Top Three Areas Increasing Operating Costs: Occupational Safety and Hazards**

<b>Industry</b>	<b>Total Respondents</b>	<b>No</b>	<b>Yes</b>
<b>Fruit-Melons</b>	3	100.00%	0.00%
<b>Horticulture</b>	33	96.97%	3.03%
<b>Poultry</b>	19	94.74%	5.26%
<b>Cattle, Hogs, and Dairy</b>	251	94.42%	5.58%
<b>Timber</b>	17	94.12%	5.88%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	120	93.33%	6.67%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	30	93.33%	6.67%
<b>Horses</b>	55	92.73%	7.27%
<b>Vegetables-Leafy</b>	12	91.67%	8.33%
<b>Other Animals &amp; Insects</b>	58	91.38%	8.62%
<b>Vegetables-Roots</b>	8	87.50%	12.50%
<b>Fruit-Deciduous</b>	54	87.04%	12.96%
<b>Fruit-Stone</b>	60	86.67%	13.33%
<b>Fruit-Other</b>	134	86.57%	13.43%
<b>Fruit-Citrus</b>	111	86.49%	13.51%
<b>Berries</b>	13	84.62%	15.38%
<b>Tree Nuts</b>	188	84.04%	15.96%
<b>Grapes</b>	195	83.59%	16.41%
<b>Vegetables-Other</b>	12	83.33%	16.67%
<b>Vegetables-Vines</b>	30	80.00%	20.00%
<b>Aquaculture</b>	3	66.67%	33.33%

**Table G-6: Top Three Areas Increasing Operating Costs: Pesticide Application**

<b>Industry</b>	<b>Total Respondents</b>	<b>No</b>	<b>Yes</b>
Timber	17	88.24%	11.76%
Other Animals & Insects	58	86.21%	13.79%
Vegetables-Leafy	12	83.33%	16.67%
Horses	55	78.18%	21.82%
Horticulture	33	72.73%	27.27%
Vegetables-Vines	30	70.00%	30.00%
Grass, Grains, Seeds, and Fiber-Nonhuman	120	69.17%	30.83%
Vegetables-Other	12	66.67%	33.33%
Fruit-Melons	3	66.67%	33.33%
Grass, Grains, Seeds, and Fiber-Human	30	66.67%	33.33%
Fruit-Deciduous	54	62.96%	37.04%
Fruit-Stone	60	58.33%	41.67%
Fruit-Other	134	57.46%	42.54%
Grapes	195	56.92%	43.08%
Fruit-Citrus	111	55.86%	44.14%
Berries	13	53.85%	46.15%
Tree Nuts	188	53.19%	46.81%
Vegetables-Roots	8	50.00%	50.00%

**Table G-7: Top Three Areas Increasing Operating Costs: Pesticide Registration**

<b>Industry</b>	<b>Total Respondents</b>	<b>No</b>	<b>Yes</b>
Vegetables-Roots	8	100.00%	0.00%
Fruit-Melons	3	100.00%	0.00%
Other Animals & Insects	58	93.10%	6.90%
Vegetables-Leafy	12	91.67%	8.33%
Timber	17	88.24%	11.76%
Berries	13	84.62%	15.38%
Grass, Grains, Seeds, and Fiber-Nonhuman	120	83.33%	16.67%
Horticulture	33	81.82%	18.18%
Fruit-Stone	60	81.67%	18.33%
Grapes	195	77.95%	22.05%
Vegetables-Vines	30	76.67%	23.33%
Grass, Grains, Seeds, and Fiber-Human	30	76.67%	23.33%
Tree Nuts	188	75.00%	25.00%
Vegetables-Other	12	75.00%	25.00%
Fruit-Citrus	111	72.97%	27.03%
Fruit-Other	134	68.66%	31.34%
Fruit-Deciduous	54	68.52%	31.48%

**Table G-8: Top Three Areas Increasing Operating Costs: Unsure**

<b>Industry</b>	<b>Total Respondents</b>	<b>No</b>	<b>Yes</b>
<b>Berries</b>	13	100.00%	0.00%
<b>Vegetables-Other</b>	12	100.00%	0.00%
<b>Fruit-Melons</b>	3	100.00%	0.00%
<b>Aquaculture</b>	3	100.00%	0.00%
<b>Fruit-Stone</b>	60	96.67%	3.33%
<b>Grapes</b>	195	94.87%	5.13%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	30	93.33%	6.67%
<b>Fruit-Deciduous</b>	54	92.59%	7.41%
<b>Tree Nuts</b>	188	92.55%	7.45%
<b>Fruit-Citrus</b>	111	91.89%	8.11%
<b>Vegetables-Leafy</b>	12	91.67%	8.33%
<b>Horticulture</b>	33	87.88%	12.12%
<b>Vegetables-Roots</b>	8	87.50%	12.50%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	120	85.83%	14.17%
<b>Cattle, Hogs, and Dairy</b>	251	85.26%	14.74%
<b>Fruit-Other</b>	134	85.07%	14.93%
<b>Other Animals &amp; Insects</b>	58	84.48%	15.52%
<b>Horses</b>	55	83.64%	16.36%
<b>Vegetables-Vines</b>	30	83.33%	16.67%
<b>Poultry</b>	19	78.95%	21.05%
<b>Timber</b>	17	70.59%	29.41%

**Table G-9: Top Three Areas Increasing Operating Costs: Wildlife Protection**

<b>Industry</b>	<b>Total Respondents</b>	<b>No</b>	<b>Yes</b>
<b>Vegetables-Leafy</b>	12	100.00%	0.00%
<b>Vegetables-Roots</b>	8	100.00%	0.00%
<b>Poultry</b>	19	100.00%	0.00%
<b>Fruit-Stone</b>	60	98.33%	1.67%
<b>Fruit-Deciduous</b>	54	98.15%	1.85%
<b>Tree Nuts</b>	188	97.87%	2.13%
<b>Horticulture</b>	33	96.97%	3.03%
<b>Fruit-Other</b>	134	96.27%	3.73%
<b>Grapes</b>	195	94.87%	5.13%
<b>Vegetables-Vines</b>	30	93.33%	6.67%
<b>Fruit-Citrus</b>	111	92.79%	7.21%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	120	90.83%	9.17%
<b>Horses</b>	55	89.09%	10.91%
<b>Cattle, Hogs, and Dairy</b>	251	88.84%	11.16%
<b>Other Animals &amp; Insects</b>	58	87.93%	12.07%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	30	86.67%	13.33%
<b>Berries</b>	13	84.62%	15.38%
<b>Vegetables-Other</b>	12	83.33%	16.67%
<b>Timber</b>	17	70.59%	29.41%
<b>Fruit-Melons</b>	3	66.67%	33.33%
<b>Aquaculture</b>	3	66.67%	33.33%

**Table G-10: Top Three Areas Increasing Operating Costs: Workers' Compensation Insurance**

<b>Industry</b>	<b>Total Respondents</b>	<b>No</b>	<b>Yes</b>
<b>Timber</b>	17	94.12%	5.88%
<b>Horses</b>	55	80.00%	20.00%
<b>Poultry</b>	19	73.68%	26.32%
<b>Other Animals &amp; Insects</b>	58	72.41%	27.59%
<b>Cattle, Hogs, and Dairy</b>	251	70.52%	29.48%
<b>Fruit-Other</b>	134	64.18%	35.82%
<b>Berries</b>	13	61.54%	38.46%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	120	60.00%	40.00%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	30	60.00%	40.00%
<b>Fruit-Deciduous</b>	54	59.26%	40.74%
<b>Tree Nuts</b>	188	56.91%	43.09%
<b>Fruit-Citrus</b>	111	54.05%	45.95%
<b>Vegetables-Vines</b>	30	53.33%	46.67%
<b>Horticulture</b>	33	51.52%	48.48%
<b>Vegetables-Leafy</b>	12	50.00%	50.00%
<b>Grapes</b>	195	46.15%	53.85%
<b>Vegetables-Other</b>	12	41.67%	58.33%
<b>Fruit-Stone</b>	60	38.33%	61.67%
<b>Vegetables-Roots</b>	8	37.50%	62.50%
<b>Fruit-Melons</b>	3	0.00%	100.00%
<b>Aquaculture</b>	3	0.00%	100.00%

**Table G-11: Top Three Areas Increasing Operating Costs: Solid and Hazardous Waste Disposal**

<b>Industry</b>	<b>Total Respondents</b>	<b>No</b>	<b>Yes</b>
<b>Vegetables-Leafy</b>	12	100.00%	0.00%
<b>Vegetables-Roots</b>	8	100.00%	0.00%
<b>Fruit-Melons</b>	3	100.00%	0.00%
<b>Vegetables-Vines</b>	30	93.33%	6.67%
<b>Fruit-Other</b>	134	91.79%	8.21%
<b>Fruit-Citrus</b>	111	90.99%	9.01%
<b>Fruit-Deciduous</b>	54	88.89%	11.11%
<b>Tree Nuts</b>	188	88.83%	11.17%
<b>Timber</b>	17	88.24%	11.76%
<b>Fruit-Stone</b>	60	86.67%	13.33%
<b>Cattle, Hogs, and Dairy</b>	251	86.45%	13.55%
<b>Grapes</b>	195	86.15%	13.85%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	120	85.83%	14.17%
<b>Berries</b>	13	84.62%	15.38%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	30	80.00%	20.00%
<b>Other Animals &amp; Insects</b>	58	79.31%	20.69%
<b>Horses</b>	55	78.18%	21.82%
<b>Poultry</b>	19	73.68%	26.32%
<b>Horticulture</b>	33	69.70%	30.30%
<b>Vegetables-Other</b>	12	66.67%	33.33%
<b>Aquaculture</b>	3	66.67%	33.33%

**Table G-12: Top Three Areas Increasing Operating Costs: Water Quality Compliance**

<b>Industry</b>	<b>Total Respondents</b>	<b>No</b>	<b>Yes</b>
<b>Horticulture</b>	33	93.94%	6.06%
<b>Other Animals &amp; Insects</b>	58	91.38%	8.62%
<b>Fruit-Deciduous</b>	54	88.89%	11.11%
<b>Vegetables-Other</b>	12	83.33%	16.67%
<b>Vegetables-Leafy</b>	12	83.33%	16.67%
<b>Fruit-Other</b>	134	82.84%	17.16%
<b>Fruit-Citrus</b>	111	81.98%	18.02%
<b>Vegetables-Vines</b>	30	80.00%	20.00%
<b>Fruit-Stone</b>	60	80.00%	20.00%
<b>Poultry</b>	19	78.95%	21.05%
<b>Horses</b>	55	78.18%	21.82%
<b>Cattle, Hogs, and Dairy</b>	251	77.29%	22.71%
<b>Grass, Grains, Seeds, and Fiber-Nonhuman</b>	120	76.67%	23.33%
<b>Tree Nuts</b>	188	76.06%	23.94%
<b>Grapes</b>	195	75.38%	24.62%
<b>Vegetables-Roots</b>	8	75.00%	25.00%
<b>Berries</b>	13	69.23%	30.77%
<b>Aquaculture</b>	3	66.67%	33.33%
<b>Grass, Grains, Seeds, and Fiber-Human</b>	30	63.33%	36.67%
<b>Timber</b>	17	58.82%	41.18%
<b>Fruit-Melons</b>	3	33.33%	66.67%

**Table G-13: Top Three Areas Increasing Operating Costs: Air Quality Compliance**

<b>Region</b>	<b>Total Respondents</b>	<b>No</b>	<b>Yes</b>
<b>Northeast Mountain</b>	10	100.00%	0.00%
<b>South Coast</b>	140	96.43%	3.57%
<b>Sierra Nevada</b>	73	93.15%	6.85%
<b>Central Coast</b>	207	89.86%	10.14%
<b>South Desert</b>	66	86.36%	13.64%
<b>North Mountain</b>	26	84.62%	15.38%
<b>North Coast</b>	30	76.67%	23.33%
<b>Sacramento Valley</b>	129	65.12%	34.88%
<b>San Joaquin Valley</b>	346	55.20%	44.80%

**Table G-14: Top Three Areas Increasing Operating Costs: Food Safety Regulations**

Region	Total Respondents	No	Yes
Sierra Nevada	73	97.26%	2.74%
North Mountain	26	96.15%	3.85%
Central Coast	207	95.17%	4.83%
South Coast	140	95.00%	5.00%
Sacramento Valley	129	94.57%	5.43%
San Joaquin Valley	346	93.35%	6.65%
North Coast	30	93.33%	6.67%
South Desert	66	92.42%	7.58%
Northeast Mountain	10	90.00%	10.00%

**Table G-15: Top Three Areas Increasing Operating Costs: Land Use Restrictions**

Region	Total Respondents	No	Yes
Northeast Mountain	10	90.00%	10.00%
San Joaquin Valley	346	89.88%	10.12%
Sacramento Valley	129	85.27%	14.73%
Sierra Nevada	73	84.93%	15.07%
South Desert	66	84.85%	15.15%
North Mountain	26	76.92%	23.08%
North Coast	30	76.67%	23.33%
South Coast	140	74.29%	25.71%
Central Coast	207	70.53%	29.47%

**Table G-16: Top Three Areas Increasing Operating Costs: None**

Region	Total Respondents	No	Yes
San Joaquin Valley	346	90.46%	9.54%
Northeast Mountain	10	90.00%	10.00%
North Mountain	26	88.46%	11.54%
Sacramento Valley	129	85.27%	14.73%
South Coast	140	80.71%	19.29%
Central Coast	207	80.68%	19.32%
South Desert	66	77.27%	22.73%
North Coast	30	76.67%	23.33%
Sierra Nevada	73	68.49%	31.51%



**Table G-17: Top Three Areas Increasing Operating Costs: Occupational Safety and Hazards**

Region	Total Respondents	No	Yes
North Mountain	26	100.00%	0.00%
Sierra Nevada	73	95.89%	4.11%
North Coast	30	93.33%	6.67%
Northeast Mountain	10	90.00%	10.00%
Central Coast	207	89.86%	10.14%
Sacramento Valley	129	88.37%	11.63%
San Joaquin Valley	346	88.15%	11.85%
South Desert	66	86.36%	13.64%
South Coast	140	85.71%	14.29%

**Table G-18: Top Three Areas Increasing Operating Costs: Pesticide Application**

Region	Total Respondents	No	Yes
North Coast	30	90.00%	10.00%
North Mountain	26	88.46%	11.54%
South Desert	66	77.27%	22.73%
Sierra Nevada	73	72.60%	27.40%
Central Coast	207	69.57%	30.43%
Sacramento Valley	129	67.44%	32.56%
South Coast	140	64.29%	35.71%
Northeast Mountain	10	60.00%	40.00%
San Joaquin Valley	346	57.51%	42.49%

**Table G-19: Top Three Areas Increasing Operating Costs: Pesticide Registration**

Region	Total Respondents	No	Yes
North Coast	30	93.33%	6.67%
North Mountain	26	92.31%	7.69%
Sierra Nevada	73	87.67%	12.33%
South Desert	66	86.36%	13.64%
Central Coast	207	83.09%	16.91%
Northeast Mountain	10	80.00%	20.00%
Sacramento Valley	129	79.84%	20.16%
San Joaquin Valley	346	77.75%	22.25%
South Coast	140	75.00%	25.00%

**Table G-20: Top Three Areas Increasing Operating Costs: Unsure**

Region	Total Respondents	No	Yes
Sacramento Valley	129	91.47%	8.53%
Central Coast	207	91.30%	8.70%
Northeast Mountain	10	90.00%	10.00%
Sierra Nevada	73	89.04%	10.96%
San Joaquin Valley	346	88.15%	11.85%
South Coast	140	87.86%	12.14%
North Coast	30	86.67%	13.33%
South Desert	66	84.85%	15.15%
North Mountain	26	80.77%	19.23%

**Table G-21: Top Three Areas Increasing Operating Costs: Wildlife Protection**

Region	Total Respondents	No	Yes
Sierra Nevada	73	98.63%	1.37%
South Desert	66	95.45%	4.55%
San Joaquin Valley	346	95.38%	4.62%
Sacramento Valley	129	93.02%	6.98%
North Mountain	26	92.31%	7.69%
South Coast	140	92.14%	7.86%
Northeast Mountain	10	90.00%	10.00%
Central Coast	207	89.37%	10.63%
North Coast	30	86.67%	13.33%

**Table G-22: Top Three Areas Increasing Operating Costs: Workers' Compensation Insurance**

Region	Total Respondents	No	Yes
North Coast	30	73.33%	26.67%
Sierra Nevada	73	72.60%	27.40%
South Desert	66	71.21%	28.79%
Northeast Mountain	10	70.00%	30.00%
South Coast	140	65.71%	34.29%
North Mountain	26	65.38%	34.62%
Central Coast	207	61.35%	38.65%
San Joaquin Valley	346	56.07%	43.93%
Sacramento Valley	129	51.94%	48.06%

**Table G-23: Top Three Areas Increasing Operating Costs: Solid and Hazardous Waste Disposal**

Region	Total Respondents	No	Yes
Northeast Mountain	10	100.00%	0.00%
Sierra Nevada	73	89.04%	10.96%
North Mountain	26	88.46%	11.54%
San Joaquin Valley	346	87.28%	12.72%
North Coast	30	86.67%	13.33%
South Coast	140	86.43%	13.57%
South Desert	66	86.36%	13.64%
Sacramento Valley	129	86.05%	13.95%
Central Coast	207	84.06%	15.94%

**Table G-24: Top Three Areas Increasing Operating Costs: Water Quality Compliance**

Region	Total Respondents	No	Yes
Northeast Mountain	10	90.00%	10.00%
South Desert	66	86.36%	13.64%
South Coast	140	85.71%	14.29%
San Joaquin Valley	346	82.95%	17.05%
Sierra Nevada	73	79.45%	20.55%
Central Coast	207	77.78%	22.22%
Sacramento Valley	129	69.77%	30.23%
North Mountain	26	69.23%	30.77%
North Coast	30	66.67%	33.33%

**Table G-25: Top Three Areas Increasing Operating Costs: Air Quality Compliance**

Income Category	Total Respondents	No	Yes
Under \$10,000	387	83.20%	16.80%
\$100,000 to \$249,999	94	78.72%	21.28%
\$10,000 to \$49,999	262	76.72%	23.28%
\$250,000 \$499,000	37	62.16%	37.84%
\$50,000 to \$99,999	113	61.95%	38.05%
\$500,000 and Above	91	58.24%	41.76%

**Table G-26: Top Three Areas Increasing Operating Costs: Food Safety Regulations**

Income Category	Total Respondents	No	Yes
\$50,000 to \$99,999	113	96.46%	3.54%
\$10,000 to \$49,999	262	96.18%	3.82%
Under \$10,000	387	94.83%	5.17%
\$100,000 to \$249,999	94	93.62%	6.38%
\$250,000 \$499,000	37	89.19%	10.81%
\$500,000 and Above	91	85.71%	14.29%

**Table G-27: Top Three Areas Increasing Operating Costs: Land Use Restrictions**

Income Category	Total Respondents	No	Yes
\$250,000 \$499,000	37	86.49%	13.51%
\$500,000 and Above	91	85.71%	14.29%
\$10,000 to \$49,999	262	83.59%	16.41%
\$100,000 to \$249,999	94	82.98%	17.02%
\$50,000 to \$99,999	113	82.30%	17.70%
Under \$10,000	387	78.55%	21.45%

**Table G-28: Top Three Areas Increasing Operating Costs: None**

Income Category	Total Respondents	No	Yes
\$500,000 and Above	91	100.00%	0.00%
\$250,000 \$499,000	37	97.30%	2.70%
\$100,000 to \$249,999	94	95.74%	4.26%
\$50,000 to \$99,999	113	92.04%	7.96%
\$10,000 to \$49,999	262	83.59%	16.41%
Under \$10,000	387	73.64%	26.36%

**Table G-29: Top Three Areas Increasing Operating Costs: Occupational Safety and Hazards**

Income Category	Total Respondents	No	Yes
Under \$10,000	387	92.51%	7.49%
\$10,000 to \$49,999	262	91.22%	8.78%
\$100,000 to \$249,999	94	89.36%	10.64%
\$250,000 \$499,000	37	86.49%	13.51%
\$50,000 to \$99,999	113	82.30%	17.70%
\$500,000 and Above	91	78.02%	21.98%

**Table G-30: Top Three Areas Increasing Operating Costs: Pesticide Application**

Income Category	Total Respondents	No	Yes
Under \$10,000	387	73.64%	26.36%
\$500,000 and Above	91	67.03%	32.97%
\$100,000 to \$249,999	94	64.89%	35.11%
\$250,000 \$499,000	37	62.16%	37.84%
\$10,000 to \$49,999	262	59.54%	40.46%
\$50,000 to \$99,999	113	59.29%	40.71%

**Table G-31: Top Three Areas Increasing Operating Costs: Pesticide Registration**

Income Category	Total Respondents	No	Yes
\$500,000 and Above	91	86.81%	13.19%
\$100,000 to \$249,999	94	81.91%	18.09%
Under \$10,000	387	81.65%	18.35%
\$250,000 \$499,000	37	81.08%	18.92%
\$50,000 to \$99,999	113	80.53%	19.47%
\$10,000 to \$49,999	262	77.48%	22.52%

**Table G-32: Top Three Areas Increasing Operating Costs: Unsure**

Income Category	Total Respondents	No	Yes
\$250,000 \$499,000	37	100.00%	0.00%
\$500,000 and Above	91	98.90%	1.10%
\$50,000 to \$99,999	113	94.69%	5.31%
\$100,000 to \$249,999	94	94.68%	5.32%
\$10,000 to \$49,999	262	86.64%	13.36%
Under \$10,000	387	83.46%	16.54%

**Table G-33: Top Three Areas Increasing Operating Costs: Wildlife Protection**

Income Category	Total Respondents	No	Yes
\$50,000 to \$99,999	113	96.46%	3.54%
\$250,000 \$499,000	37	94.59%	5.41%
\$10,000 to \$49,999	262	93.89%	6.11%
Under \$10,000	387	93.54%	6.46%
\$500,000 and Above	91	91.21%	8.79%
\$100,000 to \$249,999	94	88.30%	11.70%

**Table G-34: Top Three Areas Increasing Operating Costs: Workers' Compensation Insurance**

Income Category	Total Respondents	No	Yes
Under \$10,000	387	86.30%	13.70%
\$10,000 to \$49,999	262	65.65%	34.35%
\$50,000 to \$99,999	113	43.36%	56.64%
\$100,000 to \$249,999	94	26.60%	73.40%
\$250,000 \$499,000	37	21.62%	78.38%
\$500,000 and Above	91	14.29%	85.71%

**Table G-35: Top Three Areas Increasing Operating Costs: Solid and Hazardous Waste Disposal**

<b>Income Category</b>	<b>Total Respondents</b>	<b>No</b>	<b>Yes</b>
<b>\$50,000 to \$99,999</b>	113	91.15%	8.85%
<b>\$100,000 to \$249,999</b>	94	90.43%	9.57%
<b>\$10,000 to \$49,999</b>	262	87.40%	12.60%
<b>\$500,000 and Above</b>	91	86.81%	13.19%
<b>Under \$10,000</b>	387	84.24%	15.76%
<b>\$250,000 \$499,000</b>	37	78.38%	21.62%

**Table G-36: Top Three Areas Increasing Operating Costs: Water Quality Compliance**

<b>Income Category</b>	<b>Total Respondents</b>	<b>No</b>	<b>Yes</b>
<b>Under \$10,000</b>	387	84.24%	15.76%
<b>\$10,000 to \$49,999</b>	262	80.53%	19.47%
<b>\$50,000 to \$99,999</b>	113	80.53%	19.47%
<b>\$100,000 to \$249,999</b>	94	73.40%	26.60%
<b>\$500,000 and Above</b>	91	70.33%	29.67%
<b>\$250,000 \$499,000</b>	37	67.57%	32.43%

## **Appendix H: Pesticide Registration Case Study Appendix**

Crop Development and pest occurrence in fresh market peaches (S. San Joaquin Valley, CA)

Crop Development	J	F	M	A	M	J	J	A	S	O	N	D
Dormancy												
Bud Break												
Bloom												
Pollination												
Fruit Development												
Harvest												
Post-harvest												
Storage												
Cultural Practices	J	F	M	A	M	J	J	A	S	O	N	D
Cultivation												
Irrigation												
Pruning												
Thinning												
Frost Protection												
Girdling												
Fertilizer Application												
Pest Management Activities	J	F	M	A	M	J	J	A	S	O	N	D
Soil Sampling												
Scouting												
Insecticide Applications												
Dormant Applications												
Fungicide Applications												
Use of Pheromones												
Herbicide Applications												
Nematicide Applications												
Vertebrate Control												
Insects and Mites	J	F	M	A	M	J	J	A	S	O	N	D
San Jose Scale												
Peach Twig Borer												
Aphids												
European Red Mite												
Fruit Tree Leaf Roller												
Thrips												
Stinkbugs												
Oriental Fruit Moth												
Codling Moth												
Mites												
Katydid												
Omnivorous Leaf Roller												

Data based on collective field observations and experiments.

Timings for pests indicate when monitoring or treatment activities can occur.

This information extracted from "A Pest Management Strategic Plan for Peach Production in

CA"



## APPENDIX – additional information

Please note that the following were provided as hard copies in the appendix of the final report.

Previcur<sup>®</sup> fungicide label: <http://www.bayercropscienceus.com>

Intrepid<sup>®</sup> insecticide label: <http://www.dowagro.com/usag/prod/068.htm>

Rimon<sup>®</sup> insecticide label: <http://www.cromptoncorp.com>

UC IPM Pest Management Guidelines for apples, tomatoes, and peaches.  
<http://www.ipm.ucdavis.edu/PMG/>

Reduced Risk Pesticide Use Trends in California: <http://www.cdpr.ca.gov/dprdatabase.htm>

## **Appendix I: Timber Harvesting Case Study Appendices**

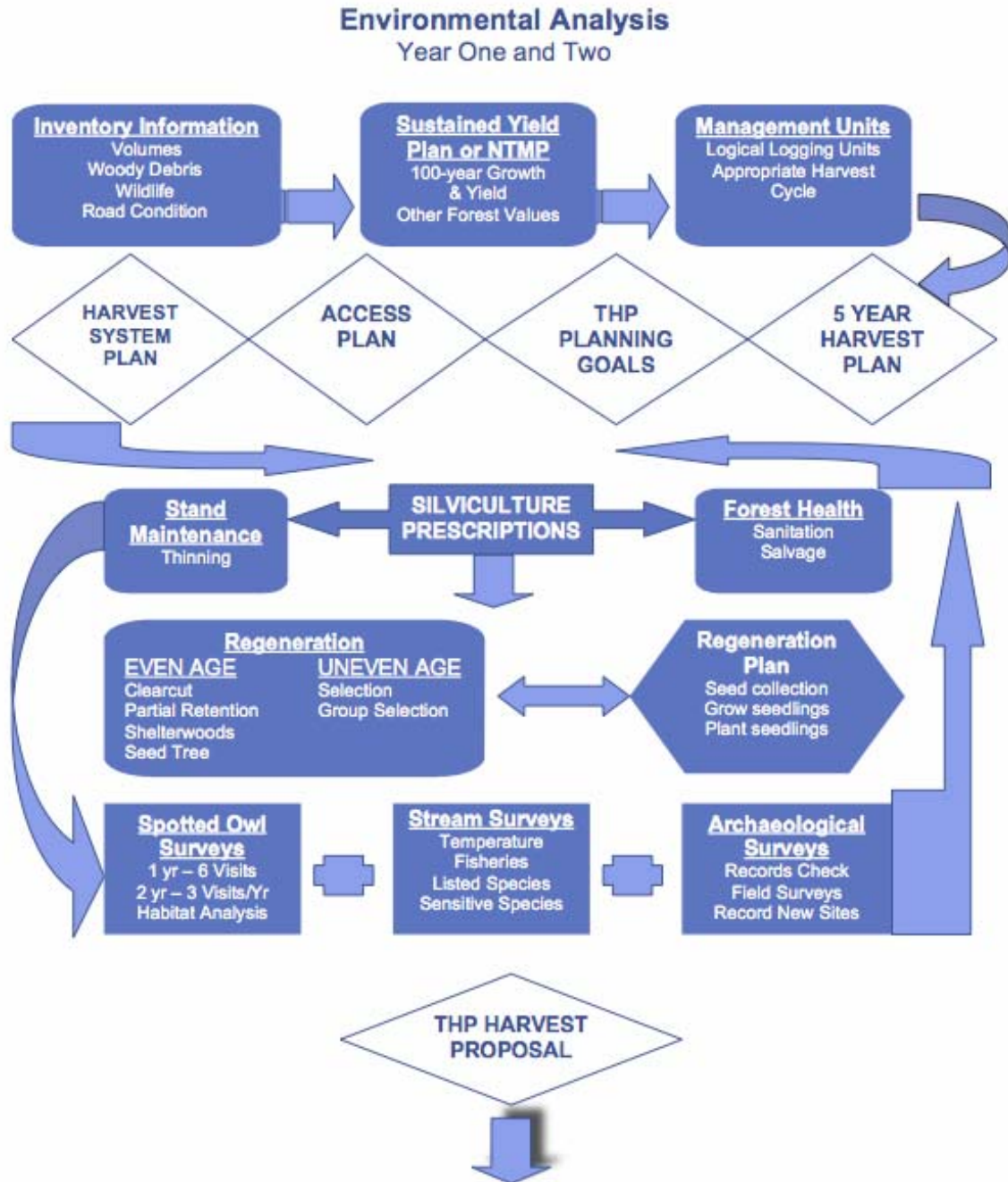
**Appendix I-1**  
**Summary of Key Events and Regulatory Actions affecting the CFPA**

Year	Description	Origin of Issue(s)	
		Federal	State
1973	Passage of SB 183 - Z'Berg-Nejedly CFPA resulting from court ruling that the 1945 "forest practices act" was unconstitutional.		X
1976	Revised CFPA's THP to conform to CEQA in response to successful legal action by NRDC.		X
1981	SB 856 removed county level control over THPs which in turn resulted in special rule Subdistricts administered by CDF		X
1982	Implementation of Erosion Hazard Rating System requiring an addendum to each THP. Adoption of Resource Conversation Standards for stocking requirement rule.	X	
1983	Implementation of Roads and Landings Rules. Implementation of new Watercourse and Lake Protection Zone Rules.	X	
1988	Resulting from a 5 year multidisciplinary team review process of timber harvest operations in response to Section 208 (non-point source) of Clean Water Act, a range of new rules, documentation, and RPF/LTO training were adopted.	X	
1989	Implementation of new Erosion Control and Maintenance rules including a three year prescribed maintenance period after completion of harvesting. Adoption of new site preparation rules for protection of multiple resource values. Requires an addendum to THP. Formation of the first of numerous task forces dealing with cumulative impacts as a result of ruling in <i>EPIC v. Johnson, 1985</i> .	X	
1990	Implementation of new Erosion Hazard Rating system. Adopted emergency rules for Northern Spotted Owl habitat areas.	X	X
1991	Failure of voter initiatives (Sierra and Grand Accords) forced BOF to adopt numerous emergency rules most of which were adopted permanently. The major ones were as follows. Adoption of new Cumulative Impacts rules requiring additional THP material in Addendum #2; new in-stream monitoring plans and protocols per THP. Adoption of major new WLPZ and Roads & Landings rules to enact non-point source pollution (CWA Section 208) recommendations after expiration of general waiver for silvicultural practices. Additional rule amendments for Northern Spotted Owl habitat areas. Adoption of emergency rules for protection of Marbled Murrelet habitat. Adoption of rule amendments for archeological and historical sites. Further regulatory constraints on even-aged mgmt. (i.e. clearcutting). Requirement for industrial and large non-industrial owners to develop long-term mgmt. plans (SYP, Option A, NTMP). More information requirements in THP when late seral stage stands (sometimes called "old growth") are present.	X	
1992	Revision of Marbled Murrelet habitat protection rules	X	X
1993	Adoption of new THP rules for "sensitive" watersheds	X	

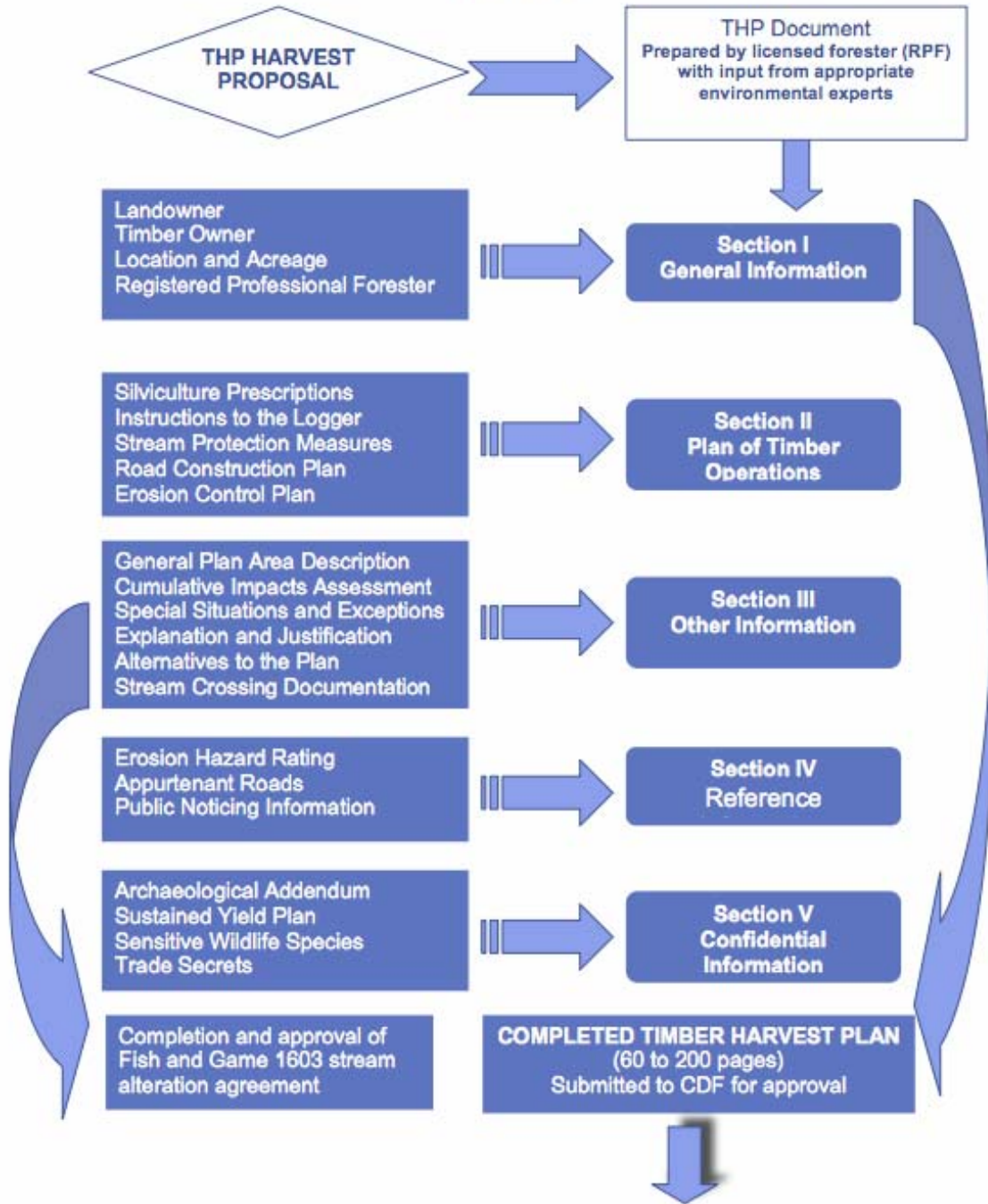
1994	"35 points of light" - rule and definition clarifications. Adoption of new Sensitive Watersheds & Domestic Water Supplies rules directing the BOF to classify a watershed as "sensitive" thereby requiring more intensive protection measures and greater documentation in relevant THPs. Adoption of new Silviculture for Sustained Yield rules resulting from failed voter initiatives to protect perceived forest values. Adoption of new rules for operations in late successional stage stands.	X	X
1995	"23 points of light" - clarification of 23 rules/definitions left over from 1994.	X	
1997	Adoption of new Class III WLPZ rules to increase protection measures on ephemeral streams during harvesting operations.	X	
1999	Adoption of revised Cumulative Impacts Assessment rules impacting interpretation of Winter Period rules. Seven other rule amendments and definitions were adopted.	X	
2000	Adoption of major new protection measures for Threatened and Impaired Watersheds ("interim rules"), Coho Salmon Consideration rules, Plan Submitter, RPF and LTO Responsibilities rules resulting from CWA Section 303d actions.	X	
2001	Requires Certified Engineering Geologist to review timber operations in or near steep WLPZ areas. Requires complete water drafting plan be included in THP when drafting takes place. Increase WLPZ tree retention requirements and designation for "large, old trees"	X	
2002	Adoption of Interim Watershed Mitigation Addendum rule package proposed by landowners and resource managers by requiring additional watershed analysis, site-specific concerns and consideration of additional protection measures for watersheds containing listed anadromous salmonids. Designation of "Threatened and Impaired" watersheds.	X	X

Sources: Martin 1989, Yee 2004, Delfino 2004.

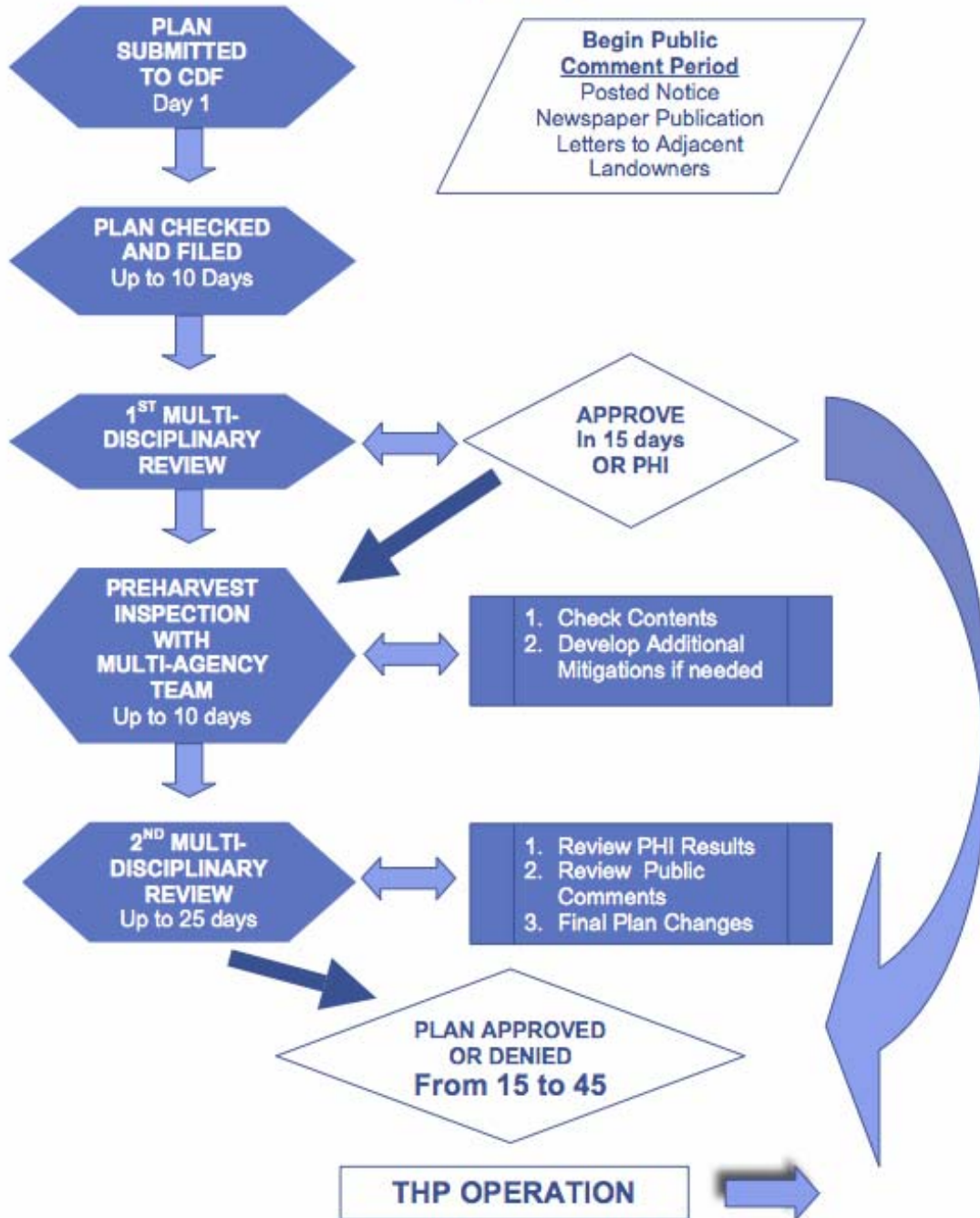
**Appendix I-2  
California's THP Approval Process and Sequence of Actions**



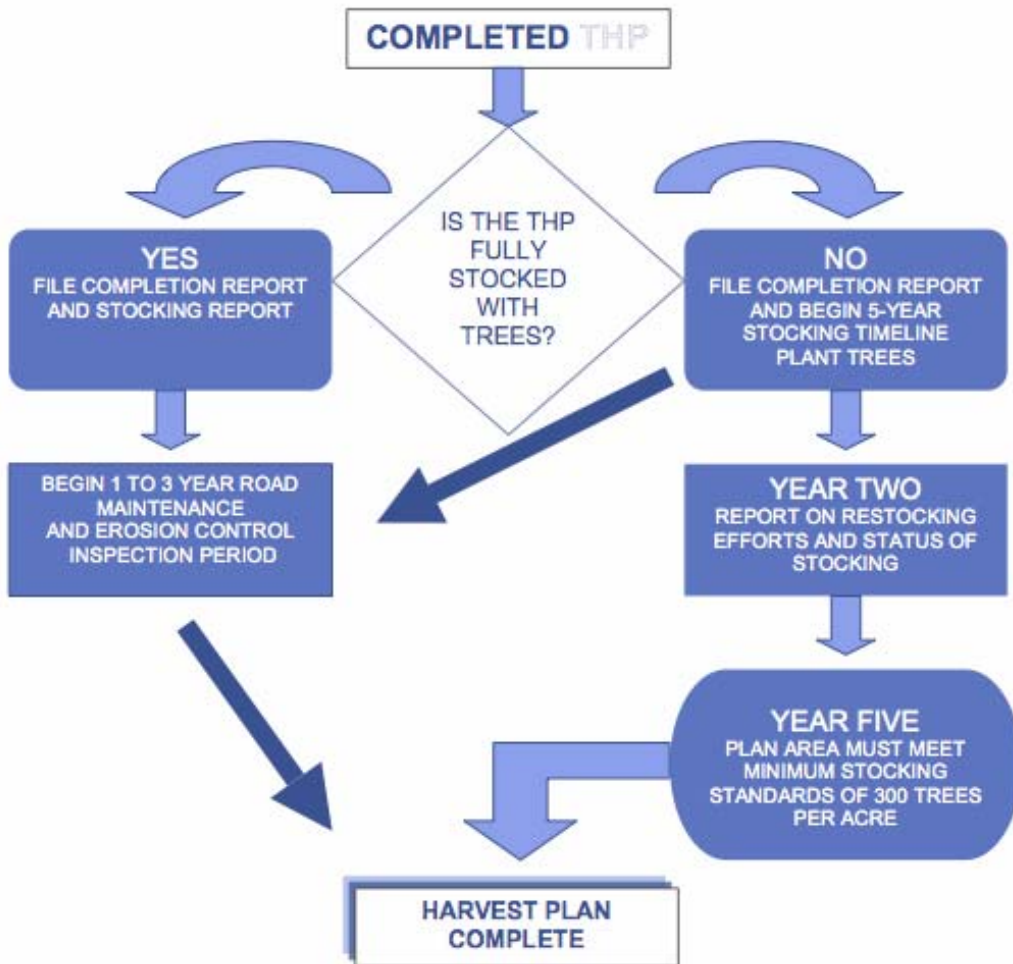
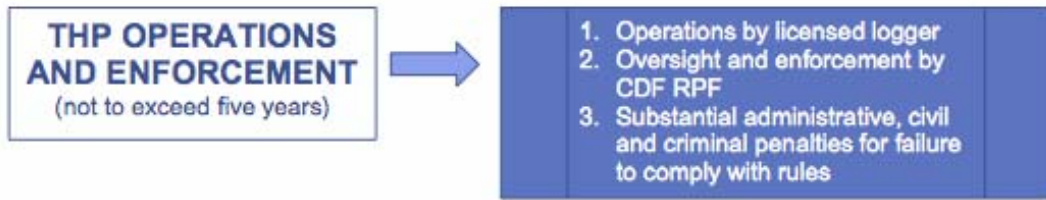
## Plan Contents and Documentation Year Three



## THP Review Process Year Three





## Operation and Post Harvest Process Year Three to Year Eleven





**Appendix I-3  
Oregon's Notice of Operation**

NOTIFICATION OF OPERATION/APPLICATION FOR PERMIT	
STATE OF OREGON	
 <p style="text-align: center;"><b>Department of Forestry</b></p> <p style="text-align: center;">Shoreline in Forestry</p>	 <p style="text-align: center;"><b>Department of Revenue</b></p> <p style="text-align: center;">ON-SITE INSPECTIONS MAY BE CONDUCTED BY THE STATE FORESTERY DREST PRACTICES FORESTER TO ENSURE COMPLIANCE WITH ALL THE LAWS AND RULES GOVERNING FIRE PROTECTION ON PRIVATE LAND.</p>
<p>1. COUNTY (Enter only one): _____</p>	
<p>2. NOTICE AND PERMIT TYPE</p> <p>2A. NOTICE TO THE STATE FORESTER THAT OPERATION WILL BE CONDUCTED ON LANDS DESCRIBED ON REVERSE (ORS 427.670).                  2B. APPLICATION FOR PERMIT TO OPERATE POWER DRIVEN MACHINERY (ORS 477.625).                  2C. NOTICE TO THE STATE FORESTER AND THE DEPARTMENT OF REVENUE OF THE INTENT TO HARVEST TIMBER (ORS 321.560).</p>	
<p>3. REPRESENTATIVE: PLEASE PRINT: Person to be contacted in case of Fire Emergency (Designated Representative) _____ Area Code &amp; Phone No. _____</p>	
<p>4. Timber Sale Name and/or Number: _____</p> <p>CHECK ONE SHARDED BOX BELOW TO INDICATE WHO FILLED OUT THE APPLICATION.</p>	
<p><b>5. OPERATOR</b></p> <p>ATTENTION: If you are conducting timber harvesting or soil construction within 100 feet of overhead or underground utility lines, call the Oregon Utility Notification Center at 1-800-330-2344. Request that the owner of the line be notified, and record the number issued to you by the Oregon Utility Notification Center here: _____</p>	
<p><b>6. LANDOWNER</b></p> <p>Timber harvesting may result in a tree planting requirement on the landowner. Call a Department of Forestry office for more information.</p>	
<p><b>7. WESTERN OREGON PRIVATE LAND ONLY</b></p> <p>Name: _____ RC: _____                  Business Name: _____ EG: _____                  Mailing Address - Street Address: _____ S: _____                  City, State and Zip Code: _____ Area Code &amp; Phone No. _____                  Name: _____                  Business Name: _____                  Mailing Address - Street Address: _____                  City, State and Zip Code: _____ Area Code &amp; Phone No. _____                  Timber Owner Employer Identification Number: _____ OR Social Security Number: _____</p>	
<p><b>8. TIMBER OWNER AND TAX PAYER</b></p> <p>You are required to provide a Social Security Number OR Tax Payer Identification Number by the Oregon Department of Revenue's Statute ORS 321.015. The Social Security Number will be used ONLY for the purpose of identifying you to the Department of Revenue for the collection of Timber Tax.</p>	
<p>Notification Number: _____</p> <p>Geographic Area: _____                  Date Received: _____ Time: _____                  District: _____ Office: _____</p>	
<p>Please describe the intent of the operation and any other information that may be relevant to the Forest Practices Forester.</p> <p><b>APPLICANT REMARKS:</b></p>	