

Challenges to Co-Management of Food Safety and Environmental Protection: A Grower Survey

July 2009

Prepared by **Melanie Beretti**

Resource Conservation District of Monterey County

744 La Guardia Street, Building A

Salinas, CA 93905

831-424-1036 ext.3



www.rcdmonterey.org

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ACKNOWLEDGEMENTS



Agricultural Commissioner

Thank you to the following co-sponsors:

The Resource Conservation District of Monterey County worked collaboratively with the Monterey County Agricultural Commissioner's Office, Grower-Shipper Association of Central California, Western Growers, Central Coast Agricultural Water Quality Coalition and The Nature Conservancy to conduct this survey.

Special thanks and acknowledgements to the following:

Melanie Beretti MA, RCD Program Director
Paul Robins, RCD Executive Director

All the Central Coast growers that participated in the survey and the Monterey County growers that provided input to our draft survey.

Dr. Jeff Langholz, Dr. Karen Lowell, Dave Metz MA, Dr. Priya Shahani, and Dr. Diana Stuart for professional support during research design, analysis and writing.

Additional thanks and recognition to the following:

All our professional colleagues and their valuable knowledge, insight and feedback for this project (in alphabetical order): Jo Ann Baumgartner, Jim Bogart, Jennifer Clark, Dave Cramer, Darlene Din, April England, Jeane Errea, Chris Fischer, Hank Giclas, Rob Gularte, Dina Iden, Robert LaFleur, Eric Lauritzen, Jessica Lee, Lisa Lurie, Afrin Malik, Jim Manassero, Dawn Mathes, Kay Mercer, Laura Mills, Bob Roach, Traci Roberts, Emily Sloane, Colby Willoughby, Tim York and members of the Monterey County Farm Bureau Land Use Committee.

The Central Coast Regional Water Quality Control Board for providing a comprehensive mailing list and operation size data of Central Coast irrigated row crop farming operations.

The San Mateo Agricultural Commissioner's Office for providing a comprehensive mailing list of San Mateo County irrigated row crop farming operations.

Cover photo credits:

Photo courtesy of the USDA Natural Resources Conservation Service.

Funding Sources

Funding for the development and distribution of this document was provided in part through agreements with The Nature Conservancy (TNC) and the USDA Natural Resources Conservation Service. TNC's support was made possible by a grant from the Produce Safety Project at Georgetown University.

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I. EXECUTIVE SUMMARY

Growers on the Central Coast of California face increasing demands and liability to both protect environmental resources and ensure a safe food supply. Consumer concerns are heightened, national legislative efforts to develop mandatory, enforceable food safety standards are underway, and growers are under increasing pressure to comply with a complex array of food safety requirements and environmental regulatory obligations. The coordinated management (co-management) of food safety and environmental protection is being challenged by real or perceived incompatibilities between these priorities, placing the agriculture industry in the difficult position of having to develop reasonable food safety standards and risk reducing actions based on an insufficient body of science to guide those efforts. Successful co-management must be informed about both the drivers and on-the-ground impacts resulting from the challenges confronting the agricultural industry.

The Resource Conservation District of Monterey County, in collaboration with conservation organizations and agricultural industry groups, conducted a mail survey of Central Coast irrigated row crop operations to obtain a clearer understanding of the both the drivers and implications of challenges to co-managing food safety and environmental protection. This survey was developed to:

- *Better understand the key drivers presenting obstacles to co-management within the production, marketing, distribution and retail chain;*
- *Determine which farming operations are experiencing the most pressure as a result of co-management challenges; and*
- *Assess if and how the on-the-ground impacts of these challenges have changed over time.*

In the spring of 2009, the survey plus two follow-up post cards were mailed to all 647 known irrigated row crop operations on the Central Coast (San Mateo, Santa Cruz, Santa Clara, San Benito, Monterey, San Luis Obispo and Santa Barbara Counties). We received 178 completed surveys (27.5% response rate).

Leafy green growers, large operations and conventional operations were most likely to experience co-management challenges. In addition, some organic operations and operations that produce strawberries, Brussels sprouts, and artichokes were facing similar challenges. The survey also found that respondents who sell their produce to processors or national or international buyers were most likely to experience challenges to co-management. Respondents who sell to grower-shippers reported similar experiences, but the survey suggests that some of the competing requirements coming through grower-shippers were originating from buyers higher up the market chain (processors and national/international buyers). In the current climate of zero tolerance for risk, co-management efforts are facing significant obstacles. The survey data suggest that the use of the Leafy Green Marketing Agreement “Metrics” and food safety programs employed by national or international buyers and processors were most likely to present obstacles.

The survey also suggests that food safety professionals conducting in-field audits were having a strong influence on co-management efforts. Respondents encountered potential obstacles to co-management as a result of in-field risk assessments that identify food safety concerns associated with environmental features and the requirement that corrective action is taken as a conditional requirement to be able to sell the produce grown in proximity to the features of concern. Respondents who sell to processors and national or international buyers experienced more pressure from the auditors representing these companies that may result in challenges to co-management. Respondents were in a challenging position needing to balance steps to ensure safe food with environmental protection efforts.

The sometimes seemingly incompatible demands between food safety and environmental protection and subsequent actions taken to address food safety concerns associated with environmental features have the potential to result in negative environmental impacts. The data suggest there was a reduction in the use of the less environmentally sensitive practices since 2008. As the agricultural community refines its approach to protecting food safety, the in-field dynamic between food safety and environmental protection will continue to evolve.

Respondents were investing significant resources into efforts to ensure food safety and protect the environment. Growers also were bearing the majority of costs and losses as a result of challenges arising for the co-management of food safety guidelines and environmental protection. Economies of scale appeared to be a relevant factor placing smaller operations at a disadvantage and potentially increasing their financial susceptibility to costs associated with increasing regulations and challenges to co-management.

The results of this survey contribute significantly to our understanding of some of the drivers and points of influence creating challenges to co-management for food safety and environmental protection. Based on these findings, it is clear that efforts to promote co-management will require open dialogue and collaboration amongst the agricultural industry (including handlers and buyers), food safety scientists and private companies, human health and environmental regulatory agencies, and environmental scientists and organizations.

II. INTRODUCTION

A. Agriculture on the Central Coast of California

The Central Coast of California is one of the most productive and profitable agricultural regions in California, reflecting a gross production value of more than six billion dollars in 2008^{1,2,3,4,5,6,7} contributing 14% of California's agricultural economy. The region's fertile soils and climate are ideal for the cultivation of high value specialty crops; the region produces over 200 crops, including lettuce, strawberries, raspberries, artichokes, asparagus, broccoli, carrots, cauliflower, celery, fresh herbs, mushrooms, onions, peas, spinach, wine grapes, tree fruit and nuts. Over 40% of the nation's fresh cut head lettuce is produced in the seven Central Coast counties, along with 70% of the nation's leaf lettuce and 70% of the nation's strawberries⁸. Agriculture in the region is a local economic driver and provides a multiplier effect (stimulating jobs and revenues beyond those directly employed by the agricultural industry) that not only supports local economies, but ultimately supplies grocery stores and restaurants throughout the country and world.

The agricultural production and distribution system on the Central Coast is complex and multidimensional. Farming companies are typically family-owned and in these families, the farming business has often been the way of life for three and four generations. Data provided by the Central Coast Regional Water Quality Control Board's Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands⁹ (Region 3 which includes San Benito, Santa Clara, Santa Cruz, Monterey, San Luis Obispo, and Santa Barbara counties) show that nearly 600 irrigated row crop operations (excludes vineyards, orchards, greenhouses, nurseries) are enrolled in the program, operating just over 260,000 irrigated acres. Of these operations, 13% of the enrolled companies operate farms larger than 1000 acres (representing 67% of the total enrolled irrigated acreage). Thirty-six percent (36%) of the enrolled companies operate farms between 100-999 acres (representing 29% of the total enrolled irrigated acreage). The remaining operations, approximately 51% of the companies operate farms less than 100 acres (representing 4% of the total enrolled irrigated acreage).

The size of farming operations and total number of operations varies greatly throughout the region, based on 2007 Census of Agriculture data⁸(Table 1). San Luis Obispo and Santa Barbara Counties have the highest number of harvested cropland operations, 1,557 and 1,132 respectively. Monterey County has the most total harvest cropland acres (227,834 acres) and the largest average harvested cropland farm size (333 acres). San Mateo County has the fewest harvested cropland operations (161) and also the smallest average harvested cropland farm size (31 acres). Gross production value varies greatly by county as well. Monterey County's gross production value was \$3.8 billion for 2008¹, whereas San Mateo County's gross production value was \$17 million in 2007⁴.

¹ Monterey County Agricultural Commissioner's Office (2008). Monterey County Crop Report 2008.

² Santa Cruz County Agricultural Commissioner's Office (2008). Santa Cruz County 2008 Crop Report.

³ San Benito County Agricultural Commissioner's Office (2007). San Benito County 2007 Crop Report.

⁴ San Mateo County Agricultural Commissioner's Office (2007). San Mateo County 2007 Agricultural Crop Report.

⁵ Santa Clara County Agricultural Commissioner's Office (2007). Santa Clara County Agricultural Crop Report 2007.

⁶ Santa Barbara County Agricultural Commissioner's Office (2008). Agricultural Crop Report 2008, Santa Barbara County.

⁷ San Luis Obispo County Agricultural Commissioner's Office (2008). Fresh From the Field: 2008 Annual Report.

⁸ USDA National Agricultural Statistics Service (2007). 2007 Census of Agriculture: California.

⁹ Central Coast Regional Water Quality Control Board (Region 3). Conditional Waiver of Waste Discharge Requirements for Discharges from Irrigated Lands enrollment data provided by Water Board staff, June 2009.

TABLE 1: Differences in Farm Size and Number of Operations in Central Coast Counties

	Number of Farms	HARVESTED CROPLAND	
		Total Cropland (Acres)	Average Farm Size (Acres)
<i>Monterey</i>	685	227,834	333
<i>San Benito</i>	324	32,571	100
<i>San Luis Obispo</i>	1,557	105,492	68
<i>San Mateo</i>	161	4,909	31
<i>Santa Barbara</i>	1,132	93,280	82
<i>Santa Clara</i>	647	23,381	36
<i>Santa Cruz</i>	522	20,698	40

The majority of produce grown on the Central Coast are grown by farmers that do not have direct access to the market and need to sell and distribute their produce through a complex tiered process, described and diagrammed below. A relatively small number of farmers grow, market, and sell their produce directly to consumers through farmers markets or by delivering directly to the consumers or local stores; this mechanism of sales and distribution is commonly referred to as “direct marketing.”

In the tiered marketing and distribution system (Figure 1), a grower sells and distributes produce through a complex tiered process. Through this process, the produce from the farm is packed on the farm to go to either immediately to a retailer or to a processor first, then to a retailer.

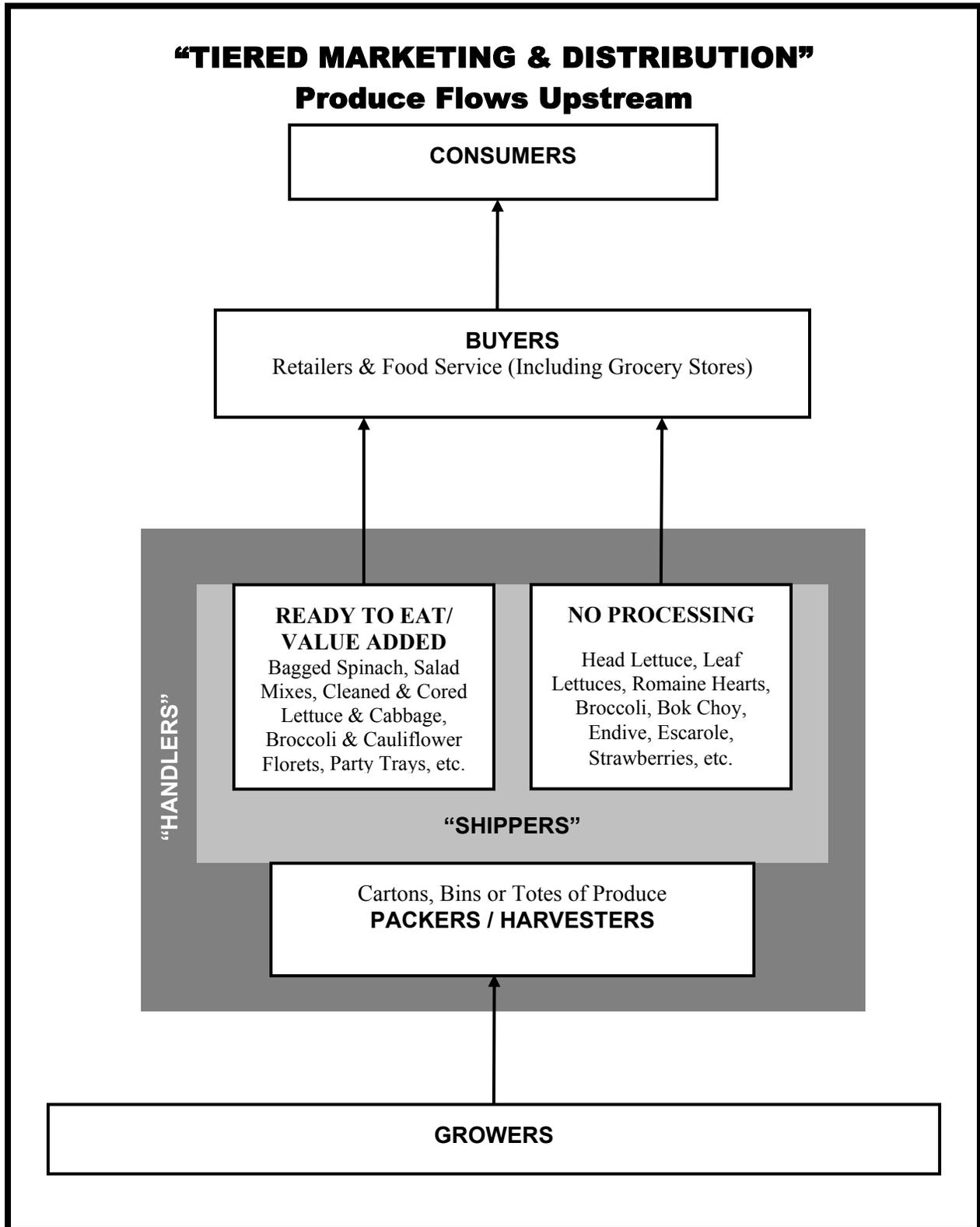
Farm → Packer/Shipper packs produce on the farm for shipment → Retailer

Examples include: strawberries, head lettuce red and green leaf lettuce, asparagus, etc.

Farm → Harvester → Processor (produce is washed, cut, and packaged) → Retailer.

Examples include: bagged salad mixes, bagged baby spinach, coleslaw, party trays, etc.

FIGURE 1: Tiered Marketing and Distribution System Demonstrates Complexity of the Market



B. Protecting Food Safety in Fresh Produce

Between 1995 and 2006, there were 20 outbreaks of food-borne illness from *E. coli* O157:H7 on lettuce or leafy greens; of these outbreaks, nine were traced back to the Central Coast¹⁰. Consequently, the issue of food safety has increased in importance. The September 2006 outbreak of *E. coli* O157:H7 associated with spinach from the Central Coast resulted in the loss of 3 lives and caused illness in more than 200 individuals. This outbreak affected consumers in 26 states, drawing national attention and acting as a catalyst for rapid change in food safety protection efforts for leafy greens. Though the US Food and Drug Administration (FDA) and the California Department of Health Services (CDHS) were not able to conclusively determine the specific cause(s) of the spinach outbreak, this case was significant because they were able to trace the outbreak to a single field as well as find the same fingerprint bacteria in nearby cattle and feral pigs¹¹.

In early 2007, with oversight by the US Department of Food and Agriculture, produce industry representatives developed the *California Leafy Green Products Handler Marketing Agreement*¹² (LGMA). Fourteen crops are defined as leafy greens by the LGMA: arugula, butter lettuce, chard, escarole, iceberg lettuce, red leaf lettuce, baby leaf lettuce, cabbage, endive, green leaf lettuce, kale, romaine lettuce, spring mix, and spinach. Nearly 120 handlers (companies that move fresh produce products from growers to the retail and food service buyers) are signatories to the agreement. These signatories, representing more than 99% of the leafy greens production in California, are contractually required to handle leafy green produce only from growers that adhere to the best management practices detailed in the *Commodity Specific Food Safety Guidelines for the Production and Harvest of Lettuce and Leafy Greens*, know as the “Metrics”¹³. The Metrics were developed and continue to be updated through a process involving the produce industry, government agencies, natural resource organizations, and scientists.

In addition to the Metrics, many companies and retailers who handle or sell produce have developed their own company-specific food safety program requirements affecting farm management practices. While produce sales move “up” the distribution chain (from Grower → Handler → Retailer), food safety requirements move “down” the chain (from Retailer → Handler → Grower). Because growers often sell their crops to multiple buyers, most now face meeting at least one if not several different sets of food safety requirements in order to sell their crop (Figure 2). In addition, different auditors or food safety professionals may have different field interpretations of the Metrics and the company-specific guidelines. Depending on the size and type of operation, a grower may conduct self-audits as well as undergo food safety inspections and audits from the California Department of Food and Agriculture, processors, grower-shippers, buyer or third-party auditors representing companies that purchase a grower’s product.

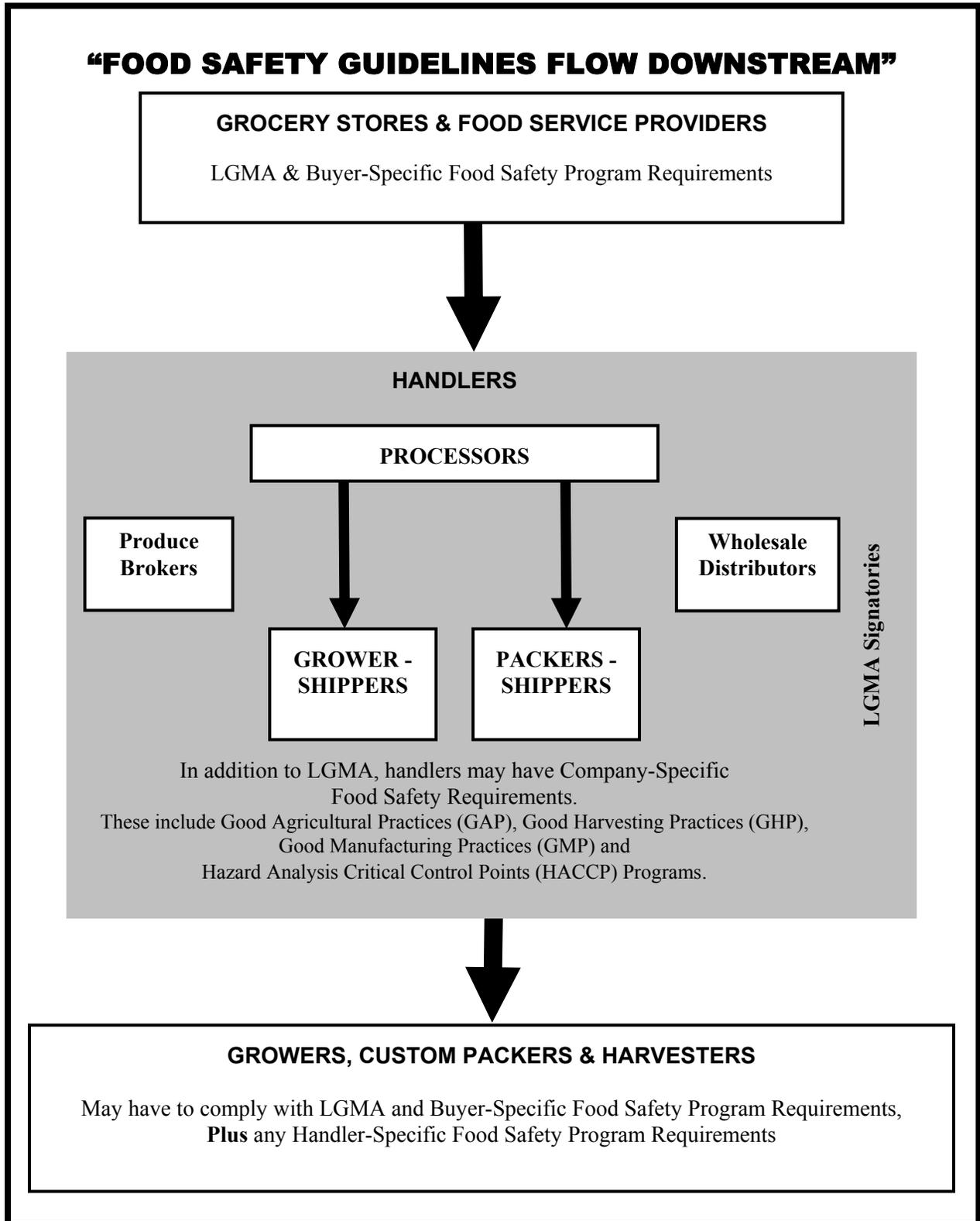
¹⁰ Centers for Disease Control and Prevention (2006). Multistate outbreak of *E. coli* O157 infections, November-December 2006. www.cdc.gov/ecoli/2006/december/121406.htm (accessed June 15, 2007).

¹¹ California Department of Health Services and US Food and Drug Administration (2007). Investigation of an *Escherichia coli* O157:H7 Outbreak Associated with Dole Pre-Packaged Spinach. Sacramento, CA. www.DHS.ca.gov.

¹² California Leafy Green Products Handler Marketing Agreement available at http://www.caleafygreens.ca.gov/members/documents/LGMAmarketingagreement03.08_000.pdf

¹³ Commodity Specific Food Safety Guidelines for the Production and Harvest of Lettuce and Leafy Greens (version 06-13-08) available at http://www.caleafygreens.ca.gov/members/documents/LGMAAcceptedGAPs06.13.08_001.pdf

FIGURE 2: Food Safety Guidelines in the Distribution Chain



C. Environmental Resources on the Central Coast of California

Agriculture is inextricably linked to fragile ecosystems; the Central Coast of California supports some of the greatest biodiversity of any temperate region in the world¹⁴. The watersheds of the Central Coast drain into the Monterey Bay National Marine Sanctuary, the largest marine sanctuary in the United States. Elkhorn Slough, located in Monterey County, is one of the largest remaining tidal wetlands in the US¹⁴. Approximately 75% of the land within these watersheds is used for agriculture¹⁵. Growers on the Central Coast of California face a myriad of environmental regulations and have notably taken a proactive approach to protecting the environment¹⁴. An important aspect of these efforts is the adoption of conservation practices. These practices aim to improve and protect water quality, prevent soil erosion, reduce the use of agricultural chemicals, and protect wildlife. However, these same practices may at times be incompatible with some food safety requirements. Additionally, the field-level interpretation of these requirements by individual growers, auditors or handler/buyer representatives may result in real or perceived incompatibilities between environmental and food safety efforts.

D. Farming, the Environment & Food Safety

Growers within this region face increasing demands and liability to both protect environmental resources and ensure a safe food supply. Consumer concerns are heightened, national legislative efforts to develop mandatory, enforceable food safety standards are underway, and growers are under increasing pressure to comply with a complex array of food safety requirements and environmental regulatory obligations. The coordinated management (co-management) of food safety and environmental protection is easier said than done, and co-management efforts are being challenged by real or perceived incompatibilities arising between these priorities^{16,17}.

The diversity of cropping systems, scale of operations, use and design of equipment, regional and local practices, environmental influences, specific on-farm soil related factors, and many other production factors defy any attempt to develop an encompassing assignment of microbial risk to commodities or to crop management practices¹⁸. The design, management, local conditions, and location in the landscape of practices to protect the environment strongly influence their environmental benefits and potential risk or benefit to in-field food safety¹⁹. With such diversity and complexity, programs to protect human health must focus on the key areas of presumptive risk potential to develop and employ a comprehensive strategy to minimize risk of crop contamination¹⁸.

The science exploring the nexus between in-field risks to human health and environmental protection practices is in its infancy. Efforts are underway to coordinate and prioritize research objectives to understand and support

¹⁴ Monterey Bay National Marine Sanctuary (1999). Water Quality Protection Program. Action Plan IV: Agriculture and Rural Lands. Monterey, CA. http://montereybay.noaa.gov/resourcepro/reports/agactioniv_99/ag99_about.html

¹⁵ State of California. 1997. Department of Conservation, Farmland Mapping and Monitoring Program. Sacramento, CA.

¹⁶ Stuart, D. 2009. A new wave of environmental degradation in California agriculture: private standards, constrained choice, and changes in land management. Doctoral Dissertation: University of California Santa Cruz.

¹⁷ Beretti, M. and D. Stuart (2008). Food Safety and Environmental Quality Impose Conflicting Demands on Central Coast Growers. California Agriculture. Volume 62 (2): pp. 68–73.

¹⁸ Suslow, T.V., M.P. Oria, L.R. Beuchat, E.H. Garrett, M.E. Parish, L.J. Harris, J.N. Farber, and F.F. Busta (2003). Chapter II: Production Practices as Risk Factors in Microbial Food Safety of Fresh and Fresh-Cut Produce. Comprehensive Reviews in Food Science and Food Safety: Vol.2 (Supplement): pp. 38-77.

¹⁹ Stuart, D. (2007). Reconciling Food Safety and Environmental Protection: A Literature Review. Available on-line at www.rcdmonterey.org.

co-management²⁰, however, conducting rigorous scientific studies and publishing defensible results from those studies can take years. As voluntary and possible regulatory food safety programs are developed for the produce industry, and regulatory and voluntary efforts to protect the environment continue to evolve, the agricultural industry is in the difficult position of having to take action to meet these changing requirements with an insufficient body of science to guide those efforts.

Some studies do exist that identify practices that have the potential, when properly designed and strategically placed in the landscape, to protect the environment and reduce risks for contamination¹⁹ in the agricultural landscape. Even with their limitations -- most of these studies did not take place in California and most typically looked at indicator organisms such as fecal coliform (rather than directly measuring pathogens) -- these existing studies may be useful to guide co-management efforts in the short-term and help identify research priorities for the long-term.

E. Purpose of Survey

This survey was developed through a collaborative partnership of agricultural industry associations, conservation organizations, and local Agricultural Commissioner's offices and aim to identify challenges facing Central Coast growers in co-managing food safety and environmental protection. This survey was developed to provide an account of current conditions being experienced by grower of fresh produce and provide a better understanding about both the drivers and implications of challenges to co-managing food safety and environmental protection.

The goals of this survey were three-fold:

1. To better understand the key drivers presenting obstacles to co-management within the production, marketing, distribution and retail chain;
2. To determine which farming operations are experiencing the most pressure as a result of co-management challenges; and
3. To assess if and how the on-the-ground impacts of these challenges have changed over time.

With the results of the survey, we hope to both better understand and communicate challenges growers face in the co-management of food safety and environmental protection. Where incompatibilities between food safety and environmental protection were identified, we hoped to gain a better understanding of their origins in the production/distribution/marketing/buying chain. We also hoped the survey will be useful to support the collaborative development of in-field food safety guidelines that are science based, adaptive, consistent and effectively focused on high risk factors for leafy greens and other produce.

²⁰ Bianchi, M., K. Mercer, and D. Crohn (2007). Coordinated Management of Water Quality Management Practices and Food Safety Good Agricultural Practices: Summary of Conference – Outcome and Results. University of California, Agriculture and Natural Resources. Available at <http://groups.ucanr.org/wqfscconf/>

F. Definitions

Leafy Greens: The fourteen leafy green products covered by the LGMA include Arugula, Butter Lettuce, Chard, Escarole, Iceberg Lettuce, Red Leaf Lettuce, Baby Leaf Lettuce, Cabbage, Endive, Green Leaf Lettuce, Kale, Romaine Lettuce, Spring Mix, and Spinach.

Leafy Green Marketing Agreement (LGMA): California Leafy Green Products Handler Marketing Agreement issued by the Department of Food and Agriculture of the State of California. All actions of the LGMA and its Advisory Board must be approved by the Secretary of CDFA. See www.caleafygreens.ca.gov for more information.

LGMA 'Metrics', or Commodity Specific Food Safety Guidelines for the Production and Harvest of Lettuce and Leafy Greens: Food Safety Best Management Practices for Lettuce and Leafy Greens Guidance document developed by Western Growers working with regulatory agencies, scientists, produce industry representatives, and other interested parties. The document is accepted by the Leafy Green Marketing Agreement Board and applies to all signatory handlers and associated growers under the Leafy Green Marketing Agreement.

Handler: Defined by the Leafy Green Marketing Agreement as any person who handles, processes, ships or distributes leafy green product for market, whether as owner, agent, employee, broker or otherwise. This definition does not include a retailer or grower.

Signatory Handler: Any handler who has voluntarily signed the Leafy Green Marketing Agreement. Once signed, it becomes mandatory for those handlers to purchase product solely from farmers who comply with the food safety practices accepted by the LGMA Board. Nearly 120 handlers representing over 99% of the volume of California leafy greens are currently signatories.

Growers: Individuals and/or companies that grow and sell leafy green products.

Packers: Companies that provide labor crews and transportation from field to cooler or processing plant for the harvest of leafy green products.

Harvesters: Labor crews that harvest and field pack leafy greens products. They may be employed by the grower-shipper or hired through a contract harvesting company.

Shippers: Companies that transport fresh and/or value-added leafy green products to wholesale distributors and retail and foodservice buyers.

Grower-Shippers: Companies that grow, pack, and ship fresh and/or value-added leafy green products to wholesale distributors and retail and foodservice buyers.

Grower-Packers: Individuals and/or companies that grow, harvest and pack their own leafy green products for transportation from field to cooler or processing plant but do not sell directly to wholesale distributors or retail and foodservice buyers.

Processors: Companies that contract for product to be grown and/or buy, receive and process leafy green products for "value added" packaged products such as bagged iceberg and romaine lettuce, spinach, spring mix,

etc... Many processing companies also ship their product to wholesale distributors and retail and foodservice buyers.

Retail and Foodservice Buyers: Grocers, restaurants, hospitals, schools, prisons, hotels, cruise ships, military, airlines and others that purchase fresh and/or value-added leafy green products from wholesale buyers, shippers, processors, and growers for sale to consumers. Some corporate grocers and foodservice companies provide their own trucking/shipping fleet to transport products from wholesale buyers or processors

Wholesale Distributors: Distributors that purchase fresh and/or value-added leafy green products from shippers, processors, and growers, for sale and distribution to retail and foodservice buyers.

US Food and Drug Administration (FDA): The FDA is responsible for protecting the public health by assuring the safety, efficacy, and security of our nation's food supply.

California Department of Food and Agriculture (CDFA): CDFA's mission is to help the governor and Legislature ensure delivery of safe food and fiber through responsible environmental stewardship in a fair marketplace for all Californians.

California Department of Health Services (CDHS): The CDHS food safety program mission is to protect and improve the health of consumers by assuring foods are safe, and are not adulterated, misbranded, or falsely advertised.

CDFA Auditor: California Department of Food and Agriculture (CDFA) employs specially certified auditors to conduct LGMA audits. These auditors operate with oversight from CDFA, but are certified and trained by the USDA under the auspices of the National Good Agricultural Practice program practices which incorporate the U.S. FDA's Commodity Specific Guidance Documents. Audits are conducted on a regular and random basis, for which LGMA signatory handlers pay through fees.

Private Third Party Food Safety Program: Companies that develop food safety programs for the produce industry.

Buyer Food Safety Program: Some individual companies that buy produce have food safety program requirements that must be adhered to by the growers and handlers that sell produce to the company.

'Own' Food Safety Program: Some individual Grower-Shippers or Grower-Packers have in-house food safety program requirements for the production, harvest, and, if applicable, processing of produce.

Wildlife: Non-domestic animals including deer, feral pigs, amphibians, reptiles and birds.

Conservation practice: Actions taken on the land by a land owner or manager/farmer to protect, enhance or conserve a natural resource such as topsoil, water, native vegetation or wildlife. Practices include the gamut from drip irrigation and nutrient management to habitat development, but only those that are considered to have a potential impact on food safety are referenced in this survey.

Non-crop Vegetation: Vegetation not harvested as a crop that is either resident or planted in and adjacent to or near farmed land. This includes cover crop (in-field); field border vegetation such as weedy areas, filter strips or

hedgerows; and nearby expanses of open non-cropped land, whether in low-statured (grasses, etc.) or tall (trees and shrubs) vegetation regardless of habitat value.

Waterbodies: On-farm and near-farm waterbodies include man-made and natural features. Man-made waterbodies are those that do not occur naturally in the landscape; they range from drainage and supply ditches to irrigation reservoirs and tailwater basins. Natural waterbodies include natural ponds, wetlands, rivers and streams.

III. SURVEY METHODS

During the spring of 2009, the Resource Conservation District of Monterey County conducted a mail survey of Central Coast irrigated row crop operations. The survey was co-sponsored by the Grower-Shipper Association of Central California, Central Coast Agricultural Water Quality Coalition, Western Growers, Monterey County Agricultural Commissioner's Office and The Nature Conservancy. This survey addresses pre-harvest food safety practices only; pre-harvest food safety measures directly influence production and land management practices and, therefore, have the potential to impact environmental protection efforts.

The survey questionnaire was developed with input from the survey co-sponsors, an opinion research professional, members of the Monterey County Farm Bureau, individual growers, a rancher, food safety professionals, and natural resource professionals. We conducted a pilot study and distributed the draft questionnaire to approximately one dozen growers or their food safety professionals to solicit input on content, clarity and accuracy of the survey questions. In response to grower input we incorporated three main changes to the questionnaire. We inserted fill-in-the-blank questions for respondents to provide cost estimates of expenditures on food safety and conservation. We included questions that allowed respondents the opportunity to identify when the LGMA Metrics or Other (Non-LGMA) Food Safety Programs were being used to identify food safety risks associated with environmental features. Lastly, we removed the fill-in-the-blank questions that asked respondents to report the number and acreage of conservation practices or environmental features that were removed or disabled.

Surveys were mailed to irrigated row crop operations in Monterey, San Benito, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, and San Luis Obispo Counties. The survey was mailed out to all known row crop operations using the Central Coast Regional Water Quality Control Board Conditional Waiver Program (Region 3) mailing list of enrolled properties, which covers every county except San Mateo. In San Mateo County the survey was mailed out to all row crop operations identified by the San Mateo County Agricultural Commissioner's Office.

The five-page survey accompanied by a cover letter (Attachment 1) was sent to all 647 known irrigated row crop operations. Two reminder post-cards were sent to the entire mailing list, at two and three weeks following the initial mailing. The survey was fully blind to insure participant anonymity. The survey contained 36 questions which consisted of multiple choice, yes/no, fill-in the blank, 5 point likert-scale, and open-ended questions. The survey also contained two optional fill-in-the-blank questions requesting the survey respondents' job title and years working with the company.

The survey was designed to better understand the experience and perspective of growers trying to simultaneously co-manage environmental protection practices with food safety programs in order to protect the environment, human health as well as their economic viability. The survey was designed to solicit details about and points of influence affecting challenges to co-managing food safety and environmental protection on Central Coast farms. This survey addresses in-field and pre-harvest management activities only.

When an environmental feature presents a real or perceived food safety risk growers must take appropriate action to address the food safety concern to be able to sell his crop; these actions *may* present a challenge to co-management. While this survey sought to identify actual and potential challenges to successful co-management of food safety and environmental protection experienced by respondents, we make no presupposition about the relative importance of either goal. Both food safety and environmental protection are important to Central Coast farming operations.

At the core of the survey, respondents were asked a series of questions related to food safety and four main categories of natural features and/or practices to protect water quality or the environment: 1) conservation practices; 2) wildlife (non-domestic animals); 3) non-crop vegetation; and 4) waterbodies. The survey aimed to identify which specific conservation practices and/or environmental features were indicated as food safety risks and what actions were taken in response to these concerns. Regarding wildlife, non-crop vegetation, and waterbodies, the survey further aimed to identify which food safety programs and/or auditors, inspectors, or others indicated a food safety risk existed. It then solicited details about how different auditors, inspectors, or others impacted the operation or required action be taken in response to the identified food safety risks.

A series of questions solicited information about farm production, operation type, vertical integration in the fresh produce market system, and adherence to various food safety or other production-related guidelines. Questions were also included that identified the financial expenditures for conservation and food safety as well as the economic costs of incompatibilities between food safety and conservation practices and environmental features. Opinion questions were included to assess respondents' perception of food safety, environmental protection, and the compatibility of food safety programs (and their field interpretations) with water quality and environmental regulations. Space was provided for respondents to write-in additional comments related to co-management of food safety and water quality/environmental protection efforts.

Analysis of results included descriptive statistics as well as the comparison of data between different groups of respondents. We looked at differences in responses based on respondents' role handling produce (e.g. grower, packer, grower-shipper) as well as to whom their produce is sold. We also explored differences in responses between those respondents who are signatory to the Leafy Green Marketing Agreement (LGMA), adhere to the LGMA accepted Commodity Specific Food Safety Guidelines for the Production and Harvest of Lettuce and Leafy Greens (LGMA Metrics), and/or adhere to other food safety programs. Other differences in responses based on crops grown (e.g. leafy greens, others) and operation characteristics (e.g. size, type) were considered. We used the Pearson Chi Square, Log-Likelihood Ratio Chi Square, and Fisher Exact Test (two-tailed) statistics, as relevant by case, to test for significant associations between variables.

IV. SURVEY RESULTS AND DISCUSSION

This survey has limitations that must be considered when interpreting results and drawing conclusions based on these results. This was a voluntary survey and since participants were self-selected we cannot assume they represent a truly random sampling of Central Coast irrigated row crop operations. Grower participation in voluntary surveys tends to be lower than ideal and caution should be used when making generalizations. Conducting the survey during spring, a busy time for growers, likely lowered the response rate. That said, the 27.5% response rate is sufficient for the purposes of this study and provides an estimated 93% confidence level with a +/- 5% margin of error.

A level of social desirability of responses should be anticipated. Social desirability is when the subject answering a questionnaire may select an answer that would be viewed as more socially acceptable. Social desirability may have led respondents to underreport actions that may be considered more likely to result in negative environmental impacts. That said, by conducting a mail survey that was fully blind and anonymous, the effect of social desirability of responses should have been minimized.

Terminology used in the survey may be interpreted differently by different respondents. While the terminology used was understood by those involved in developing the survey, it should not be assumed that all respondents would necessarily have the same understanding of some terms. Throughout this report we highlight the terms that may not be universally understood and, where relevant, we discuss the impact of this limitation on the conclusions we are able to draw.

Caution should be used when comparing the results from this survey to the 2007 grower survey. While both surveys asked many similar questions, attention must be paid when making comparisons to determine if wording or formatting differences may be limiting.

Despite these shortcomings, the data quantity and quality are sufficient to provide a general understanding of the key drivers and potential environmental impacts of the challenges to co-managing for food safety and environmental protection. Many of the results highlighted the key points of influence giving rise to co-management challenges. These points of influence warrant more focus and further study to better guide efforts toward successful co-management for food safety and environmental protection.

A. Respondent Operation and Business Information

A total of 178 surveys were returned; this is a 27.5% response rate. Of these, 154 survey respondents indicated that they grow food crops. Analysis was limited to the 154 respondents who grow food crops.

The survey asked several multiple choice and fill-in-the-blank questions designed to obtain general operation information (Q1²¹; Q2; Q3; Q4; Q5; Q6).

Nearly 100 different crops were grown by survey respondents and most respondents grew more than one crop. Broccoli (40.3%), leaf lettuce (37.1) and head lettuce (29.9%) were the most commonly grown crops. The ten most commonly grown crops are included in Table 2.

²¹ Survey questions are referenced throughout the report as "Qn". Q = "question" and n = "question number". In this example Q1 = Question 1 (see Attachment 1).

TABLE 2. Top Ten Crops Grown by Survey Respondents

Broccoli	40.3%	Carrot	16.9%
Leaf Lettuce	37.1%	Celery	16.2%
Head Lettuce	29.9%	Cabbage	15.6%
Strawberry	24.7%	Spinach	14.3%
Cauliflower	22.1%	Chard	12.3%

Respondents were also categorized into two different crop categories, “leafy greens” and “non-leafy greens”. We defined “leafy greens” using the fourteen crops defined as leafy greens in the Leafy Green Marketing Agreement: arugula; baby leaf lettuce; butter lettuce; cabbage; chard; endive; escarole; green leaf lettuce; iceberg lettuce; kale; red leaf lettuce; romaine lettuce; spinach; and spring mix. Respondents that grow leafy greens and were thus categorized as leafy green growers are not necessarily part of the Leafy Green Marketing Agreement or adhere to the Metrics. Leafy green growers may also grow non-leafy green crops. Respondents that do not grow leafy greens were categorized as “non-leafy green” growers. A total of 75 (48.7%) respondents grow leafy greens and 79 (51.3%) are non-leafy green growers.

Sixty-five percent (64.9%) of respondents classify their operation as conventional only, 12.3% as organic only, and 18.2% as both conventional and organic. Respondents indicated they operated (own or rent) a total of 87,723 acres to grow irrigated crops which represents approximately one-third of the total irrigated row crop acreage. Respondents indicated they harvested²² a total of 126,124 acres of irrigated crops in 2008. The mean operation size (based on acreage owned/rented) was 585 acres. The largest and smallest operations were 11,000 and 0.33 acres, respectively. Sixty-four of the operations (41.6%) were small (<100 acres), 64 (41.6%) were medium sized (100-999 acres) and 22 (14.3%) were large operations (≥1000 acres). Four operations (2.6%) did not report acreage owned or rented to grow crops. These percentages are similar to the size distribution of all operations.

Five mutually exclusive categories were established to define an operation: grower, grower-packer, grower-shipper, distributor, or processor. “Growers” are those who indicated they grow only. “Grower-packers” are those who indicated they both grow and pack produce. “Grower-shippers” are those who indicated they both²³ grow and ship produce; some grower-shippers also pack produce. “Distributors” are those who indicated they are wholesale distributors, regardless of whether they grow, pack or ship produce as well. “Processors” are those who indicated they were processors, regardless of whether they grow, pack or ship produce as well.

Most operations were considered Growers (57.8%), Grower-packers (11.7%) or Grower-shippers (16.9%). Only 3.2% and 2.6% of respondents are distributors or processors, respectively. Due to the limited number of respondents in these latter categories, all statistical analyses looking at the relationship between various aspects of co-management challenges and these different types of operations excludes distributors and processors.

To determine to whom respondents sell their produce, the survey listed seven of the most common types of companies that buy produce or other outlets for selling produce (Q6). The list included, in order: farmer’s markets or CSA [community supported agriculture programs]; broker; packer/shipper; processor; wholesale distributor; local/regional grocers or food service; national/international buyers. An “other” category was also included at the end of the list.

²² Acres harvested may exceed acres operated (owned and rented) when crops are grown that planted and harvested more than once in a year.

²³ The term grower-shipper accurately describes all but one operation included in this category that did not identify itself as a grower.

There is some ambiguity with the wording of the category “National/International buyers” that limits our understanding and interpretation of certain survey results. This category more accurately should have been named “National /International grocers or food service”. While it was commonly understood by those involved in the development of the survey that “national/international buyers” referred to “national/international grocers or food service”, it cannot be assumed that survey respondents had the same understanding of this category.

Nearly half (48.7%) of respondents indicated that they sell to packers or shippers. Processors (22.1%), brokers (19.5%), and local or regional grocers or food service (19.5%) were the next most common types of companies to whom respondents sell. Leafy green growers are significantly more likely to sell their produce to packers or shippers (66.7%^{**24}) and processors (32.0%^{**}) compared to non-leafy green growers (31.6% and 12.7%, respectively). Sixteen percent (15.6%) of respondents indicated they sell to others. Table 3 summarizes responses. Because respondents were able to indicate more than one buyer (and more than one-third did so), the total percentages reported in the table exceed 100%.

TABLE 3. Buyers of Produce for All Respondents

Packer/Shipper	48.7%
Processor	22.1%
Broker	19.5%
Local or Regional Grocers or Food Service	19.5%
Farmers Market or Community Supported Agriculture	16.9%
Wholesale Distributor	16.9%
National or International Buyers	8.4%

Table 4 summarizes percent respondents (all, leafy greens, and non-leafy greens) indicating they adhere to various food safety guidelines. A small percentage of respondents (5.2%) indicated they adhere to other guidelines including United States Good Agricultural Practices (GAP) and Global GAP [previously Euro GAP] for food safety. Because respondents were able to indicate more than one guideline to which they adhere (and approximately one-third did so), the total percentages reported in the table exceed 100%.

Only leafy green handlers, as defined by the Leafy Green Marketing Agreement, are able to be signatory on the LGMA. The LGMA defines a handler as any person who handles, processes, ships or distributes leafy green product for market whether as owner, agent, employee, broker or otherwise (handlers are not growers nor retailers)¹². Growers that sell to LGMA signatory handlers are required to adhere to the Metrics. Leafy green growers that do not sell to LGMA signatory handlers or non-leafy green growers that adhere to the Metrics do so either voluntarily or as a requirement of one of the companies that buy their produce.

²⁴ The star symbols indicate there is a statistically significant result. One star (*) indicates significance at p < 0.10. Two stars (**) indicates significance at p < 0.05.

TABLE 4. Food Safety Programs Adhered to by Respondents

Food Safety Program (below):	All Respondents (n = 154)	Leafy Green Growers (n = 75)	Non-Leafy Green Growers (n = 79)
Signatory to Leafy Green Marketing Agreement	20.1%	40.0%	1.3% ²⁵
Commodity Specific Food Safety Guidelines for Lettuce and Leafy Greens (LGMA Metrics)	32.5%	61.4%	5.1%
Your Own Food Safety Program	41.6%	49.3%	34.2%
Private Firm's Food Safety Program	18.8%	14.7%	22.8%
Buyer's Food Safety Program	20.1%	30.7%	25.3%

It should be noted that there is a degree of overlap between a Private Firm's and a Buyer's Food Safety Program, introducing some ambiguity in the results. In some cases a company that buys produce will employ a private consulting firm to develop and enforce its food safety program. While it was understood by those involved in the development of the survey that "Private Firm's" food safety programs was intended to mean "Third Party Auditing Firm's", it cannot be assumed that survey respondents had the same understanding of this category. Respondents who indicated that they adhere to a Private Firm's or Buyer's Food Safety Program are lumped for all analyses looking at the effect of different food safety programs.

B. Investing in Food Safety and Environmental Protection

The survey also solicited general information about respondents' feeling of responsibility toward and efforts invested toward protecting food safety and the environment on their farms. The survey asked two likert-scale opinion questions designed to understand respondents' feelings of responsibility for both food safety and environmental protection (Q34; Q35)

In addition the survey asked a multiple choice questions where respondents could indicate whether they had adopted conservation practices on their farms and which practices they use (Q9; Q11). The survey also included write-in questions for respondents to provide an estimate of how much they have spent on both in-field food safety and conservation practices (Q8; Q10). It is important to note that this survey was not designed to capture detailed information about food safety or conservation spending; it was designed to provide a general indication of the magnitude and variability of these costs.

B.1. Sense of Responsibility for Protecting Food Safety and the Environment

In general respondents felt that it is their responsibility to protect food safety on their farms. Eighty percent (79.9%) of respondents indicated that they agreed or strongly agreed with the statement "I feel it is my responsibility to protect food safety on my farm". Only 3.2% indicated they had no opinion and less than 1% disagreed with this statement. Sixteen percent (16.2%) did not respond to this question.

In general respondents also felt that it is their responsibility to protect the environment on their farms. Eighty percent (79.9%) of respondents indicated that they agreed or strongly agreed with the statement "I feel it is my responsibility to protect water quality and the environment on my farm". Only 1.9% indicated they had no opinion and less than 2% disagreed or strongly disagreed with this statement. Sixteen percent (16.3%) did not respond to this question.

²⁵ Respondent is a grower-shipper that does not grow but handles leafy greens.

B.2. Conservation Practice Adoption

Respondents reported they had adopted conservation practices on their lands, and a diverse suite of practices were employed. When considering respondents efforts to adopt conservation practices, it is important to note that because Q11 (which conservation practices have you adopted) was included in “Section II. Food Safety and Conservation Practices”, conservation practice implementation may be under reported. Some individuals skipped this section indicating it did not apply to their operation (e.g. they had no food safety concerns related to conservation practices).

The environmental benefits derived from various conservation practices (and other environmental features) depend largely on site conditions, design, operation and maintenance, and placement in the landscape. In the absence of site-specific information, we make no presuppositions about the level of environmental benefit provided by these practices or features.

Seventy-three percent (72.7%) of survey respondents indicated they had adopted at least one conservation practice on land that they farm. The most commonly adopted practices by survey respondents were cover crop (59.1%), sediment or stormwater basins (25.4%), plant-based compost (24.9%), and grassed waterways (24.0%). Other practices include tailwater recovery ponds (20.1%), vegetated filter or buffer strips (20.1%), animal-based compost (20.1%), hedgerow or windbreaks (18.8%), and riparian or stream bank restoration (14.3%). A few growers reported the adoption of constructed wetlands (3.9%) and vegetated treatment systems (7.1%). Twelve percent (11.7%) also indicated they had adopted other practices; practices specified by respondents include irrigation management, nutrient management, tillage, and land leveling.

B.3. Financial Investments for Food Safety and Environmental Protection

It is important to recall that this survey was not designed to capture detailed information about food safety or conservation spending; it was designed to provide a general indication of the magnitude and variability of these costs.

Respondents indicated that they invested significant resources in farm conservation and environmental protection efforts during the past decade. Just over half of the survey respondents (51.9%) provided an estimate of how much they spent on conservation practices in the past 10 years. Of those who provided an estimate, they spent a total of nearly \$1.5 million per year on conservation practices during the past decade. The highest spent was \$720,000 per year and lowest was \$50.00 per year. The mean expenditures were \$18,219 per operation per year and \$59 per acre per year with a median expenditure of \$2,500 per operation per year and \$15 per acre per year on conservation practices.

Respondents indicated that they invested significant resources to in-field food safety efforts during the past five years. Nearly sixty-percent of the survey respondents (59.1%) provided an estimate of how much they spent on in-field food safety protection. Of those that provided an estimate, they spent more than \$1.6 million per year on in-field food safety protection over the past 5 years. The highest spent was \$500,000 per year and lowest was \$20 per year. Mean expenditures were \$18,050 per operation per year and \$49 per acre per year with a median expenditure of \$4,000 per operation per year and \$17 per acre per year on in-field food safety.

C. Challenges to Co-Managing for In-Field Food Safety and Environmental Protection

Growers may be confronted by many potential challenges to co-management for food safety and environmental protection. The survey was organized into eight sections, three of which focused respondents on food safety as it relates to general environmental features: Food Safety and Wildlife (Section III); Food Safety and Non-Crop Vegetation (Section IV); and Food Safety and Waterbodies (Section V). The survey asked a series of multiple choice and opinion questions designed to solicit details about and identify points of influence affecting the co-management challenges faced by respondents (Q14; Q15; Q16; Q18; Q19; Q20; Q22; Q23; Q24; Q29; Q30; Q31; Q32; Q33; Q36).

The survey attempted to identify and understand trends in the messages respondents received about food safety risks associated with different environmental features, from both formal and informal sources. Formal sources include an operation's own food safety professional, California Department of Food and Agriculture inspectors for the Leafy Green Marketing Agreement, or a food safety auditor representing a company that buys produce. Informal sources can include shared experiences of other growers. For this reason some filter or general questions (Q14; Q15; Q18; Q19; Q22; Q23) asked about what respondents had been told by "auditors, inspectors, or others" (also written as auditors/inspectors/others). The detailed questions (Q16; Q20; Q24) provided respondents the opportunity to distinguish between these different sources (formal and informal).

It needs to be reiterated that when an environmental feature presents a real or perceived food safety risk growers must take appropriate action to address the food safety concern to be able to sell his crop; these actions *may* present a challenge to co-management. As previously noted, there is insufficient definitive science relating to the actual food safety risk presented by select conservation practices, so co-management challenges may arise out of the exercise of precaution. While this survey seeks to identify actual and potential challenges to successful co-management of food safety and environmental protection experienced by respondents, we make no presupposition about the relative importance of either goal.

C.1. Challenges to Co-Management: Balancing Risks and Benefits

Environmental features and conservation practices can provide environmental benefits. They may also pose a risk to food safety. When properly designed, some practices or natural features have the potential to help minimize risk of contamination. It is important to consider site-specific conditions when weighing the potential benefits and risks of various environmental features.

Environmental features were described and analyzed in four categories: conservation practices; wildlife (non-domestic animals); non-crop vegetation; and waterbodies. It is important to note that the categories of wildlife, non-crop vegetation, waterbodies as well as conservation practices (not discussed in this section) are not mutually exclusive. Non-crop vegetation and waterbodies may provide habitat that supports wildlife populations or attract wildlife as a source of food, water, or for migration. Obtaining detailed information about food safety concerns associated with each of these categories may provide important insight so as to help us understand and evaluate these concerns through targeted research and thus better direct efforts toward co-management.

Approximately half (49.3%) of the survey respondents reported that an auditor/inspector/other had indicated that wildlife, non-crop vegetation or waterbodies were risks to food safety. Wildlife (47.4%) was most commonly reported as being indicated as a food safety risk, followed by waterbodies (30.5%) and non-crop vegetation (26.0%). When an environmental feature presents a real or perceived food safety risk growers must take

appropriate action to address the food safety concern to be able to sell his crop; these actions *may* present a challenge to co-management.

In the area to write-in comments, some respondents expressed concern or frustration with the current obstacles they face to co-management for food safety and environmental protection. Many survey respondents expressed concern about apparent incompatibilities between some food safety program requirements and environmental regulations or in-field environmental efforts. Many suggested that science-based risk management is necessary; a few cited cases in which existing science is not being applied.

A couple of respondents expressed frustration with the degree of burden being placed on produce growers. A few expressed the opinion that more emphasis should be placed on other points of potential contamination (or cross-contamination) from farm to table, specifically processing and kitchen sanitation. Another respondent was concerned with the degree of burden placed on produce growers to prevent contamination given the role of livestock as a potential source for pathogens¹⁹.

C.1.a. Balancing Risks and Benefits: Wildlife

Animals indicated as food safety risks by auditors/inspectors/others include feral pigs, deer, birds, rodents, amphibians, and other wildlife such as wild dogs, raccoons, and rabbits. Because wild animals are mobile and their access to different habitats often takes them near or into cropland, it can be very difficult and costly to control their movement and access to crops. Efforts to successfully co-manage for food safety and wildlife are important yet challenging. These efforts should minimize contamination risk, making every effort possible to be cost-effective and avoid potentially detrimental impacts to native wildlife populations. Feral pigs are not considered native wildlife. Determining the food safety risk associated with wildlife species requires site specific knowledge about the species, including but not limited to their: incidence rate for carrying pathogenic organisms; population abundance and frequency of occurrence; extent to which they may enter fields; and access to human and livestock waste¹⁹.

C.1.b. Balancing Risks and Benefits: Non-Crop Vegetation

Non-Crop Vegetation indicated as food safety risks by auditors/inspectors/others include plants in farm ponds or ditches, hedgerows or windbreaks, rangeland, natural land (not grazed), wetland or riparian plants, and other vegetation including weeds. Because some types of non-crop vegetation may provide water quality and other conservation benefits, it is important to allow these features as options for growers to achieve environmental protection goals. Non-crop vegetation may also provide habitat for and may attract wildlife, creating a potential risk of crop contamination. Non-crop vegetation may also provide important habitat for animals or beneficial insects. In some circumstances non-crop vegetation may be a useful tool to reduce pathogen movement in the environment and potentially reduce pathogen populations; in doing so they may also trap pathogens, creating a potential risk to food safety if the pathogens become re-mobilized. Successful co-management of food safety and non-crop vegetation are important yet challenging to minimize food safety risks while preserving environmental benefits.

C.1.c. Balancing Risks and Benefits: Waterbodies

Waterbodies indicated as food safety risks by auditors/inspectors/others include irrigation reservoirs, sediment or stormwater basins (drain after storms), tailwater or other farm ponds, agricultural ditches, stream, river or wetlands, and other waterbodies including standing water at pump. Because certain waterbodies may provide

water quality, water conservation and other conservation benefits, it is important to allow these features as options for growers to achieve environmental protection goals. Waterbodies may also provide habitat for and attract wildlife, creating a potential risk of crop contamination from associated wildlife. Waterbodies may also provide important habitat for animals. Crop contamination may also occur from direct application (via flooding or irrigation) of contaminated water to the soil or crop. In some instances, waterbodies may be useful tools to reduce pathogen populations and movement in the environment; in doing so they may also trap pathogens, creating a potential risk to food safety if the pathogens become re-mobilized. Successful co-management of food safety and waterbodies is important yet challenging to minimize food safety risks while preserving environmental benefits

C.2. Challenges to Co-Management: Environmental Features and Potential for Incompatibility

In addition to asking respondents about specific types of environmental features, the survey asked them to provide detail information about what types of consequences they were receiving from auditors, inspectors or others. Five types of consequences were listed: required removal; deducted audit points; rejected crops; excluded land for growing; and other. When considering consequences respondents report, we must bear in mind that individuals that conduct in-field food safety audits or inspections do not have legal authority to require a grower to remove an environmental feature or exclude land from growing certain crops. Food safety professionals can advise that corrective action be taken to address an identified risk factor as a conditional requirement for a grower to be able to sell their produce.

Respondents were not provided the opportunity to indicate whether or not conservation practices or other environmental features were present on or near their ranches. If these features are not present to begin with, it would follow that they would never have been indicated as food safety risks. On the other hand, if very few respondents actually farm near a certain type of environmental feature then it would follow that very few respondents would report being told the feature is a food safety risk. The inherent bias of this short-coming is that the observed response rates for respondents reporting that certain practices or features were indicated as food safety risks are lower than the rates that would be observed if we only considered those respondents that actually had these practices or features on or near their ranch.

Nearly half of all respondents indicated they had experienced food safety concerns associated with environmental features on their farms. Respondents were also experiencing consequences as a result of the presence of some environmental features.

C.2.a. Potential for Incompatibility: Wildlife

This section only considers the 73 (47.4%) respondents that reported an auditor, inspector or other indicated that wildlife was a risk to food safety. We make no presupposition about the relative importance of either food safety or environmental protection goals. We make no presupposition about the level of risk posed by wildlife in the reported cases or significance of this risk to human health.

Of the 73 respondents who were told wildlife was a risk to food safety, respondents reported the following animals associated with these concerns: rodents (72.6%); deer (63.0%); birds (57.5%); amphibians (42.5%); feral pig (41.1%); and other (21.9%).

Additionally, these respondents reported experiencing different types of consequences from the food safety professionals identifying the risk. These consequences can be costly to growers, and depending on the type of

consequence can impair their ability to co-manage for food safety and environmental protection. Respondents who reported experiencing consequences as a result of wildlife presence in or near their fields were required to exclude wildlife (35.6%), had audit points deducted (45.2%), had crops rejected (28.8%), had land excluded for growing certain crops (34.2%), or other consequences (9.6%) due to food safety concerns associated with wildlife. Food safety professionals can advise that corrective action is needed to address an identified risk factor as a conditional requirement for a grower to be able to sell their produce. If there is evidence of animal intrusion (tracks or feces) crops coming in contact or in proximity to the evidence may not be harvestable.

C.2.b. Potential for Incompatibility: Non-Crop Vegetation

This section only considers the 40 (26.0%) respondents that reported an auditor, inspector or other indicated that non-crop vegetation was a risk to food safety. We make no presupposition about the relative importance of either food safety or environmental protection goals. We make no presupposition about the level of risk posed by non-crop vegetation in the reported cases or significance of this risk to human health.

Of the 40 respondents who were told non-crop vegetation was a risk to food safety, respondents reported the following vegetation types associated with these concerns: plants in farm ditches or ponds (70%); rangeland (55.0%); natural lands not grazed (55.0%); wetland or riparian vegetation (55.0%); hedgerows or windbreaks (27.5%); and other (10.0%).

Additionally, these respondents reported experiencing different types of consequences from the food safety professionals identifying the risk. These consequences can be costly to growers, and depending on the type of consequence can impair their ability to co-manage for food safety and environmental protection. Respondents who reported experiencing consequences as a result of non-crop vegetation presence in or near their fields were required to remove vegetation (40.0%), had audit points deducted (50.0%), had crops rejected (20.0%), had land excluded for growing certain crops (40.0%), or other consequences (7.5%) due to food safety concerns associated with non-crop vegetation. Food safety professionals can advise that corrective action is needed to address an identified risk factor as a conditional requirement for a grower to be able to sell their produce.

C.2.c. Potential for Incompatibility: Waterbodies

This section only considers the 47 (30.5%) respondents that reported an auditor, inspector or other indicated that waterbodies were a risk to food safety. We make no presupposition about the relative importance of either food safety or environmental protection goals. We make no presupposition about the level of risk posed by waterbodies in the reported cases or significance of this risk to human health.

Of the 47 respondents who were told waterbodies were a risk to food safety, respondents reported the following waterbodies associated with these concerns: irrigation reservoir (63.8%); tailwater and other farm pond (53.2%); stream, river or wetland (51.1%); agricultural ditch (44.7%); and sediment or stormwater basin (34.0%)..

There are stringent quality standards for irrigation water to insure food safety. Irrigation reservoirs are man-made ponds established and maintained for the purpose of providing clean irrigation water for crops. Similarly, tailwater recovery ponds are man-made ponds established and maintained to capture and reuse irrigation runoff. It is anticipated that these waterbodies were more often associated with food safety concerns given the stringent quality standards for water being applied to cropland.

Additionally, these respondents reported experiencing different types of consequences from the food safety professionals identifying the risk. These consequences can be costly to growers, and depending on the type of consequence can impair their ability to co-manage for food safety and environmental protection. Respondents who reported experiencing consequences as a result of waterbody presence in or near their fields were required to remove a waterbody (17.0%), had audit points deducted (44.7%), had crops rejected (6.4%), had land excluded for growing certain crops (38.3%), or other consequences (10.6%) due to food safety concerns associated with non-crop vegetation. Food safety professionals can advise that corrective action is needed to address an identified risk factor as a conditional requirement for a grower to be able to sell their produce.

C.3. Challenges to Co-Management: Operation Characteristics and Potential for Incompatibility

When considering an operation's likelihood of exposure to potentially incompatible demands between food safety and environmental protection it is necessary to consider certain operation characteristics. The survey found that the particular crops grown, how an operation is classified, and considerations of size and vertical integration of an operation are important factors.

C.3.a. Crop Type and Potential for Incompatibility

Leafy green growers (52.0%** compared to 21.5% non-leafy green growers) are significantly more likely to adhere to more than one set of food safety guidelines. These different guideline documents may include different requirements for food safety associated with environmental features that may be contrary to each other. This increases the potential for confusion and presents unique challenges to growers trying to adhere to multiple programs or guidelines.

Leafy green growers (65.3%** were significantly more likely than non-leafy greens (30.4%) to have been told wildlife was a risk to food safety. Of the respondents that grow non-leafy greens, 2 of the 4 artichoke growers and 4 of 5 Brussels sprouts growers had been told that wildlife was a risk to food safety. Nearly forty-four percent (43.5%) of strawberry growers had been told that wildlife was a risk to food safety.

Leafy green growers (42.7%** were significantly more likely than non-leafy greens (10.1%) to have been told that non-crop vegetation was a risk to food safety. As above, of non-leafy green growers, 2 of the 4 artichoke growers and 3 of 5 Brussels sprouts growers had been told that non-crop vegetation was a risk to food safety. Nine percent 8.7% of strawberry growers had been told that non-crop vegetation was a risk to food safety.

Leafy green growers (45.3%** were significantly more likely than non-leafy green growers (16.5%) to have been told that waterbodies were a risk to food safety. Of non-leafy green growers, 3 of the 4 artichoke growers and 4 of 5 Brussels sprouts growers had been told that waterbodies were a risk to food safety. Twenty-six percent (26.1%) of strawberry growers had been told that waterbodies were a risk to food safety.

Leafy green growers were contending with many more potential in-field consequences as a result of the presence of environmental features. For wildlife, non-crop vegetation, and waterbodies, leafy green growers were significantly more likely than non-leafy green growers to have incurred these consequences (Table 5)

TABLE 5. Consequences Reported by Leafy Green Growers Due to Environmental Features

	Were Required to Exclude or Remove	Had Audit Points Deducted	Had Crops Rejected	Had Acreage Excluded for Growing
Due to Wildlife	26.7%**	30.7%**	26.7%**	29.3%**
Due to Non-Crop Vegetation	20.0%**	21.3%**	9.3%**	21.3%**
Due to Waterbodies	20.0%**	20.0%**	9.3%**	21.3%**

NOTE: When considering consequences respondents report, we must bear in mind that individuals that conduct in-field food safety audits or inspections do not have legal authority to require a grower to remove an environmental feature or exclude land from growing certain crops. Food safety professionals can advise that corrective action be taken to address an identified risk factor as a conditional requirement for a grower to be able to sell their produce.

Different crops have very different growth habits and production techniques that may increase (or decrease) their susceptibility to contamination. Wildlife may be differentially attracted to different crops. Many leafy greens are eaten raw and do not have an acceptable step to kill pathogens from field to table. Some other crops are occasionally eaten raw (e.g. broccoli, cabbage, carrots) as well. Proper cooking of vegetables will kill pathogens. Cooking does not reduce the need to prevent in-field contamination of crops, however, it does provide consumers a level of protection in the event of contamination. Some crops are always cooked (e.g. artichokes, Brussels sprouts) while others are sometimes cooked (e.g. carrots, cabbage, broccoli).

C.3.b. Operation Size and Potential for Incompatibility

As an operation gets larger and/or endeavors to remain economically viable, it is likely to diversify and sell its produce to a greater number of companies. Currently, this also increases the number of different food safety guidelines to which an operation must adhere. While only 7.8% of small operations reported they adhere to multiple food safety guidelines, 90.9% of large operations and 46.9% of medium operations were adhering to multiple guidelines. Trying to adhere to multiple different sets of food safety guidelines increases the chances of encountering contradictory recommendations.

Larger and more vertically integrated operations were also more likely to encounter potential obstacles to co-management. According to respondents, large and medium operations and grower-shippers were significantly more likely to have been told certain environmental features are risks to food safety (see below).

Large (90.9%**) and medium operations (59.4%**) were significantly more likely than small operations (21.9 %) to have been told *wildlife* was a risk to food safety.

Large (59.1%**) and medium operations (37.5%**) were significantly more likely than small operations (4.7%) to have been told *non-crop vegetation* was a risk to food safety.

Large (63.6%**) and medium operations (46.9%**) were significantly more likely than small operations (3.1%) to have been told *waterbodies* were a risk to food safety. Grower-shippers (48.1%*) are significantly more likely than growers (28.1%) to have been told waterbodies are a risk to food safety.

Large and medium sized operations control the majority of agricultural lands on the Central Coast, leaving a significant portion of the landscape more susceptible to real or perceived incompatibilities between food safety and environmental protection efforts.

C.3.c. Operation Classification and Potential for Incompatibility

Respondents who farm conventionally (conventional only and mixed organic/conventional) were much more likely to encounter potential obstacles to co-management.

More than half (52.3%) of conventional growers were told that wildlife was a risk to food safety. Twenty-one percent (21.1%) organic-only operations reported they were told wildlife was a food safety risk.

Approximately one-third (30.5%) of conventional growers were told that non-crop vegetation was a risk to food safety. Five percent (5.3%) organic-only operations reported they were told non-crop vegetation was a food safety risk.

More than one-third (35.9%) of conventional growers were told that waterbodies were a risk to food safety. No organic-only operations reported they were told waterbodies were a food safety risk.

Growers selling directly to consumers, such as through farmers markets, do not fall under the LGMA and have no buyer food safety programs to adhere to. The majority of organic-only respondents reported they sold produce to farmer's markets/CSAs (68.4%) or local or regional grocers or food service (52.6%). These operations do not have to adhere to external food safety guidelines, which would explain why so few organic-only operations had encountered potential obstacles to co-management. In fact, no organic-only operation reported they sell to packers/shippers and only one organic-only operation reported that they sell to a processor or national/international buyer.

Experiencing contradictory demands between food safety and environmental protection may present unique challenges to employing some organic methods and complying with organic standards. A few organic growers emphasized the importance of maintaining wild diversity for their organic operations; one (LGMA signatory) expressed great difficulty "...meeting [California Certified Organic Farming] organics and [California Department of Food and Agriculture]".

Though federal and independent organic standards do not address food safety, we included a place for respondents to report if their organic inspector/auditor had cited food safety concerns associated with environmental features. Prior to developing the survey we had heard reports from at least one organic grower that his organic inspector/auditor had noted food safety concerns associated with environmental features, so we decided to include this option to see if these were isolated event or not. Two survey respondents that grow organic-only (10.5%) indicated they had been told by their organic inspector/auditor that some environmental features were food safety risks. Citing food safety concerns is outside the scope of organic inspectors and while we would not expect any organic inspectors to cite these concerns, the survey suggests that this may not be a wide-spread occurrence.

C.4. Challenges to Co-Management: Considering Different Food Safety Programs

One-third of respondents indicated they adhere to more than one set of food safety guidelines, increasing their potential exposure to different requirements between food safety programs as well as requirements that may be incompatible with environmental protection efforts. Questions throughout the survey asked respondents to distinguish between impacts resulting from use of the LGMA Metrics and those from Other (or Non-LGMA) Food Safety Programs.

In addition to asking respondents about specific types of environmental features, the survey asked them to provide specific information about what types of consequences they were receiving from auditors, inspectors or others. As indicated above, five types of consequences were listed: required removal; deducted audit points; rejected crops; excluded land for growing; and other. As a reminder, food safety professionals that conduct in-field food safety audits or inspections do not have legal authority to require a grower to remove an environmental feature or exclude land from grower certain crops. These professionals can require that growers take corrective action to address a food safety hazard, but do not prescribe the actions to be taken. In addition it is important to note that the LGMA Metrics does not employ a point system; the Metrics focus on identifying and documenting (on the audit checklist) risk factors and actions taken to address these risks as part of the audit process²⁶.

We make no presupposition about the relative importance of either food safety or environmental protection goals. We make no presupposition about the level of risk posed by the environmental features identified in the reported cases or significance of this risk to human health. We make no presupposition about the merits or efficacy of any food safety program.

C.4.a. Leafy Green Marketing Agreement Metrics

This section only considers the 56 respondents (referred to as “LGMA respondents”) that indicated they are signatory to the LGMA or adhere to the LGMA Metrics in Q7 of the survey. It describes the challenges to co-management reported by LGMA respondents. Since one-third of respondents adhere to more than one set of food safety guidelines, it should be noted that LGMA respondents may also adhere to other food safety program guidelines (Section C.4.b.).

A grower that adheres to the Metrics may have in-field audits conducted by his Own Food Safety Professional, his Buyer’s or a Private 3rd Party Auditor/Inspector to insure they are in compliance with the LGMA Metrics. The LGMA’s objective is to have California Department of Food and Agriculture (CDFA) inspectors conduct audits of each of its member handlers several times a year, and each of the farmers providing product to its members at least once a year. CDFA inspectors conduct in-field food safety audits to verify that growers and handlers are operating in compliance with the food safety practices accepted by the LGMA board. The California Department of Food and Agriculture employs specially certified inspectors to conduct LGMA audits. If an LGMA member is found to be out of compliance in any of these areas, they are issued an infraction. Each infraction is recorded at one of four levels, ranging from a Minor Infraction to a Flagrant Violation. The LGMA Compliance Audit Process provides opportunities for members to take corrective action on infractions that would not result in unsafe product entering the market²⁶.

Wildlife and the LGMA

Forty-seven (n=47) LGMA respondents (83.9%) were told wildlife was a risk to food safety. These 47 respondents reported that auditors, inspectors or others following the Metrics identified all classes of animals as food safety risks. The following list presents the percent of respondents that were told specific animals were risks to food safety: deer (63.8%); rodents (59.6%); feral pig (42.6%); birds (38.3%); amphibians (36.2%); and other (19.1%)

Additionally, these respondents reported experiencing consequences from the individuals identifying the risk associated with wildlife. These consequences can be costly to growers, and depending on the type of

²⁶ California Leafy Green Marketing Agreement Board website at www.caleafygreens.com.

consequence can impair their ability to co-manage for food safety and environmental protection. Sixty percent (59.6%) reported experiencing consequences from a Buyer or Third Party Auditor/Inspector; 55.3% from their Own Food Safety Professionals; and 21.3% from a CDFA Inspector.

Non-Crop Vegetation and the LGMA

Thirty (n=30) LGMA respondents (53.6%) were told non-crop vegetation was a risk to food safety. These 30 respondents reported that auditors, inspectors or others following the Metrics identified all classes of vegetation as food safety risks. The following list presents the percent of respondents that were told specific vegetation was a risk to food safety: rangeland (60.0%); plants in farm ditch or pond (56.7%); natural lands not grazed (50.0%); wetland or riparian plants (36.7%); hedgerow or windbreak (16.7%); and other (10.0%).

Additionally, these respondents reported experiencing consequences from the individuals identifying the risk associated with non-crop vegetation. These consequences can be costly to growers, and depending on the type of consequence can impair their ability to co-manage for food safety and environmental protection. Fifty-seven percent (56.7%) reported experiencing consequences from a Buyer or Third Party Auditor/Inspector; 53.3% from their Own Food Safety Professionals; and 26.7% from a CDFA Inspector.

Waterbodies and the LGMA

Thirty-six (n=36) LGMA respondents (64.3%) were told waterbodies were a risk to food safety. These 36 respondents reported that auditors, inspectors or others following the Metrics identified all classes of specific waterbodies as food safety risks. The following list presents the percent of respondents that were told the specific waterbodies was a risk to food safety: irrigation reservoir (52.8%); tailwater or other farm pond (47.2%); stream, river or wetland (47.2%); agricultural ditch (36.1%); sediment or stormwater basin (33.3%); and other (0.0%)

Additionally, these respondents reported experiencing consequences from the individuals identifying the risk associated with waterbodies. These consequences can be costly to growers, and depending on the type of consequence can impair their ability to co-manage for food safety and environmental protection. Fifty-six percent 55.6% reported experiencing consequences from a Buyer or Third Party Auditor/Inspector; 50.0% from their Own Food Safety Professionals; and 16.7% from a CDFA Inspector.

Challenges and Opportunities for Co-Management

LGMA respondents expressed the sentiment that the Metrics present challenges to co-managing food safety and environmental protection. More than half (51.5%) of the LGMA respondents disagreed or strongly disagreed with the statement "*The Leafy Green Marketing Agreement Board accepted [Metrics] are fully compatible with water quality and environmental regulations.*" Twenty-five percent (25.0%) of LGMA respondents agreed with this statement and none strongly agreed. Sixteen percent (16.1%) indicated they had no opinion. In the area to write-in comments, one respondent specifically stated that "...more collaboration between LGMA & CDFA / [California Department of Fish and Game]..." is needed.

The LGMA Metrics¹³ were developed in 2007 by university and industry scientists, food safety experts and farmers, shippers, and processors, with input from natural resource professionals. They are periodically updated to reflect changing knowledge of in-field contamination risk and address deficiencies that have been identified by those adhering to the Metrics. Review of the Metrics document reveals very minimal language or recommended actions that are potentially incompatible with efforts to protect the environment. While the Metrics do focus food safety concerns on environmental features, they also include guidance and recommendations to minimize its environmental impacts.

For example, the current version of the Metrics (June 13, 2008)¹³ state that “Lettuce/leafy greens are generally grown in rural areas that may have adjacent wetlands, wildlands, and/or parks harboring wildlife. Some wildlife species are known to be potential carriers of various human pathogens”. However, the document then proceeds to focus these concerns on “Specific wildlife species that have been shown to pose the greatest risk...”. The LGMA Metrics identify cattle, sheep, goats, pigs (domestic and wild), and deer as animals of significant risk. In another section of the document, the Metrics recommend that growers “Evaluate and implement practices to reduce the potential for the introduction of pathogens into production blocks by wind or runoff. Such practices may include but are not limited to berms, windbreaks, diversions ditches and vegetated filter strips.”

Results from the survey show that high proportions of LGMA respondents found themselves in situations where either the Metrics or their field interpretation created potential challenges to co-management. We cannot know the site-specific conditions and we make no presupposition about the level of risk posed by the environmental features in the reported cases or about the significance of this risk to human health. However, some evidence suggests that field level interpretations of the Metrics may be contributing to the challenges to co-management, despite the document’s efforts to include environmental considerations.

Several classes of animals that are not listed as “animals of significant risk” were indicated as food safety risks with the same or greater frequency than feral pigs and deer, both of which are listed as “animals of significant risk”. Deer and rodents were the wild animals most frequently reported by LGMA respondents to have been identified food safety risks by individuals using the LGMA Metrics. Rodents are not “animals of significant risk”. Birds, amphibians and feral pigs were all reported with similar frequencies to have been identified as food safety risks, yet only feral pigs are listed as “animals of significant risk”.

In another example, LGMA respondents reported with similar frequency that rangeland and natural lands (not grazed) were indicated as food safety risks by individuals using the LGMA Metrics. Cattle are known to be the largest reservoirs of *E.coli* 0157:H7 and are listed as an “animals of significant risk” by the LGMA Metrics. While we do not know the site-specific conditions for these reported cases, it seems likely that natural lands with no cattle grazing would have been identified less frequently as a food safety risk than lands where cattle graze.

It is important to note here that most research looking at the incidence of *E.coli* 0157:H7 in cattle investigated confined animal feeding operations (CAFO), where diet and proximity to other animals can increase the pathogen populations in the cattle guts as well as increase transmission rates between animals. There are very few confined animal facilities on the Central Coast; cropland on the Central Coast is instead often adjacent to rangeland as opposed to CAFOs. Cattle grazing on open rangeland should pose less risk to food safety than those in confined operations. Research shows that cattle fed hay or grass (as opposed to grain diets) have significantly lower levels of pathogenic *e.coli*^{27, 28}. In addition, grasslands in California have been shown to be an effective way to reduce inputs of waterborne *e.coli* into surface waters²⁹.

²⁷ Diez-Gonzalez, F., T.R. Callaway, et al. (1998). Grain feeding and the dissemination of acid-resistant *Escherichia coli* from cattle. *Science* 281 (5383): 1666-1668.

²⁸ Franz, E., A.D. van Diepeningen, et al. (2005). Effects of cattle feeding regimen and soil management type on the fate of *Escherichia coli* 0157:H7 and *Salmonella enterica* serovar typhimurium in manure, manure-amended soil, and lettuce. *Applied and Environmental Microbiology* 71(10): 6165-6174.

²⁹ Tate, K.W., E.R. Atwill, J.W. Bartolome, and G. Nader (2006). Significant *Escherichia coli* attenuation by vegetative buffers on annual grasslands. *Journal of Environmental Quality* 35: 795-805.

These results suggest that further efforts toward understanding site-specific conditions and potential differences in the interpretation of the Metrics may be fruitful toward successfully co-managing in-field food safety and environmental protection. The Metrics could then be reviewed and modified as able to help reduce variability in their interpretation. This may help reduce the potential for the Metrics to result in negative impacts to the environment.

C.4.b. Other (or Non-LGMA) Food Safety Programs

This section only considers the 92 respondents who indicated they adhere to their Own Food Safety Program, a Private Consulting Firm's Food Safety Program, a Buyer's Food Safety Program or other programs in Q7 of the survey. These respondents adhering to Other (or Non-LGMA) Food Safety Programs are referred to as "OFSP Respondents". Since one-third of respondents adhere to more than one set of food safety guidelines, it should be noted that OFSP respondents may also be LGMA respondents. This section presents which environmental features were identified as risks and what consequences were experienced as a result of these identified risks.

This section describes the challenges to co-management reported by OFSP respondents. We make no presupposition about the relative importance of either food safety or environmental protection goals. We neither make presuppositions about the level of risk posed by environmental features in the reported cases nor the significance of the indicated risk to human health.

Wildlife and Other (Non-LGMA) Food Safety Programs

Fifty-five (n=55) OFSP respondents (59.8%) were told wildlife was a risk to food safety. These 55 respondents reported that auditors, inspectors or others following the Other (Non-LGMA) Food Safety Programs identified all classes of animals as food safety risks. The following list presents the percent of respondents that were told specific animals were risks to food safety: rodents (47.3%); birds (43.6%); deer (32.7%); amphibians (29.1%); feral pig (23.6%); and other (16.4%)

Additionally, these respondents reported experiencing consequences from the individuals identifying the risk associated with wildlife. These consequences can be costly to growers, and depending on the type of consequence can impair their ability to co-manage for food safety and environmental protection. Forty-six percent (45.6%) reported experiencing consequences from a Buyer or Third Party Auditor/Inspector and 30.9% from their Own Food Safety Professionals.

Non-Crop Vegetation and Other (Non-LGMA) Food Safety Programs

Thirty-four (n=34) OFSP respondents (37.0%) were told non-crop vegetation was a risk to food safety. These 34 respondents reported that auditors, inspectors or others following Other (Non-LGMA) Food Safety Programs identified all classes of vegetation as food safety risks. The following list presents the percent of OFSP respondents that were told specific vegetation was a risk to food safety: plants in farm ditch or pond (55.9%); rangeland (38.2%); wetland or riparian plants (38.2%); natural lands not grazed (35.3%); hedgerow or windbreak (20.6%); and other (8.8%)

Additionally, these respondents reported experiencing consequences from the individuals identifying the risk associated with non-crop vegetation. These consequences can be costly to growers, and depending on the type of consequence can impair their ability to co-manage for food safety and environmental protection. Fifty-six percent (55.9%) from a Buyer or Third Party Auditor/Inspector and 29.4% reported consequences from their Own Food Safety Professionals.

If you consider only the 55 OFSP respondents that indicated they adhere to either a Private Consulting Firm's or Buyer's food safety program, 23 (41.8%) were told non-crop vegetation was a risk to food safety. For this group the frequency reported of cases where food safety concerns were associated with vegetation types increased fairly substantially. The following list presents the percent of these respondents (n=23) that were told specific vegetation was a risk to food safety (at a higher rate than all OFSP respondents): plants in farm ditch or pond (69.6%); rangeland (47.8%); and wetland or riparian plants (47.8%). These results suggest that buyer or private firm (which are developed for buyers) food safety programs may be imposing more demands that may inhibit co-management compared to in-house food safety programs ("our Own Food Safety Program" in Q7). However, the survey was not designed to determine the impacts resulting from any one company's food safety program.

Waterbodies and Other (Non-LGMA) Food Safety Programs

Thirty-six (n=36) OFSP respondents (39.1%) were told waterbodies were a risk to food safety. These 36 respondents reported that auditors, inspectors or others following the other (non-LGMA) food safety programs identified all classes of waterbodies as food safety risks. The following list presents the percent of respondents that were told the specific waterbodies was a risk to food safety: irrigation reservoir (50.0%); tailwater or other farm pond (36.1%); agricultural ditch (36.1%); stream, river or wetland (36.1%); and sediment or stormwater basin (27.8%).

Additionally, these respondents reported experiencing consequences from the individuals identifying the risk associated with waterbodies. These consequences can be costly to growers, and depending on the type of consequence can impair their ability to co-manage for food safety and environmental protection. Fifty-six percent (55.6%) reported consequences from a Buyer or Third Party Auditor/Inspector and 38.9% from their Own Food Safety Professionals.

If you consider only the 55 OFSP respondents that indicated they adhere to either a Private Consulting Firm's or Buyer's food safety program, 25 (45.5%) were told waterbodies were a risk to food safety. For this group the frequency reported of cases where food safety concerns were associated with these waterbody types increased fairly substantially. The following list presents the percent of these respondents (n=25) that were told specific waterbodies were a risk to food safety (at a higher rate than all OFSP respondents): irrigation reservoir (60.0%); and tailwater or other farm pond (48.0%). These results suggest that buyer or private firm (which are developed for buyers) food safety programs may be imposing more demands that may inhibit co-management compared to in-house food safety programs ("Your Own Food Safety Program" in Q7). However, the survey was not designed to determine the impacts resulting from any one company's food safety program.

Challenges and Opportunities for Co-Management

OFSP respondents expressed the sentiment that Other Food Safety Programs present challenges to co-managing food safety and environmental protection. More than forty percent (43.5%) of the OFSP respondents disagreed or strongly disagreed with the statement "*Other or Non-LGMA food safety program requirements are fully compatible with water quality and environmental regulations*". Thirteen percent (13.0%) of the OFSP respondents agreed with this statement and none strongly agreed. Twenty-seven percent (27.2%) indicated they had no opinion.

We cannot know the site-specific conditions and we make no presupposition about the level of risk posed by the environmental features in the reported cases or about the significance of this risk to human health. However, the data shows that high proportions of OFSP respondents experienced situations in which the Other (Non-LGMA) Food Safety Programs to which they adhere were potentially incompatible with co-management efforts. If we

consider only OFSP respondents adhering to either a Private Consulting Firm's or Buyer's Food Safety Program, these proportions increase for some environmental features.

Unlike the Metrics, Other Food Safety Programs are developed privately by companies and typically not made publicly available. This makes it particularly difficult to determine whether the guideline documents or their field interpretation are presenting obstacles to co-management. It is unknown how many different food safety programs exist, which further impairs efforts to reconcile seemingly incompatible demands between food safety and environmental protection. The survey does not allow us to distinguish which Other Food Safety Programs specifically were presenting obstacles to co-management for food safety and environmental features. However, results presented below in "C.5. Challenges to Co-Management: Points of Influence in the Market Chain" suggest that programs employed by Processors or National/International Buyers may be resulting in greater challenges to co-management.

These results suggest that further efforts toward understanding site-specific conditions and potential differences between different Other Food Safety Programs or their interpretation may be fruitful toward successfully co-managing in-field food safety and environmental protection.

C.5. Challenges to Co-Management: Points of Influence in the Produce Market Chain

C.5.a. Companies that Buy Produce Influence Co-Management Efforts

The survey suggests that respondents who sell to packers/shippers, processors, or national/international buyers were much more likely to encounter potential obstacles to co-management. Thirty-seven percent of respondents indicated that they sell to more than one company (or buyer).

The tiered marketing and distribution system of the produce industry and increasing consolidation among handlers and buyers³⁰ limit a grower's ability to seek out new buyers for their product. For the majority of growers, there are limited avenues by which to gain access to alternative produce buyers. Grower's are susceptible to potentially contradictory demands from different foods safety programs as many growers must adhere to multiple food safety programs as a result of this complex tiered system. Whether a grower is trying to comply with environmental regulations, growing according to organic standards, or simply being a good land steward, adhering to many food safety programs presents unique challenges to these efforts.

Packer/Shipper

Most produce must be handled by a shipper in order to be sold to retail grocers or food service facilities (e.g. restaurants). It follows, therefore, that shippers would also be in the position of funneling many companies' (to whom they sell) food safety programs and requirements down to their growers. A grower-shipper must not only comply with its buyers' food safety program requirements, but they must also insure that all the growers whose produce they handle also adhere to these requirements.

Respondents who sell to packers/shippers were more likely to have been *told the following were food safety risks*:
Wildlife (68.0%** compared to 27.8% of respondents who don't sell to packers/shippers);
Non-crop vegetation (40.0%** compared to 12.7% of respondents who don't sell to packers/shippers);
Waterbodies (52.0%** compared to 10.1% of respondents who don't sell to packers/shippers).

³⁰ Kaufman, P.R. et al. (2000). Understanding the Dynamics of Produce Markets: Consumption and Consolidation Grow. USDA Agriculture Information Bulletin No. 758.

Respondents that sell to packers/shippers were significantly more likely to have *experienced consequences* due to the presence of environmental features (Table 6). This follows since shippers are in the position of funneling many companies' food safety programs and requirements to their growers.

TABLE 6. Consequences Reported by Respondents that sell to Packer/Shipper Due to Environmental Features

	Were Required to Exclude or Remove	Had Audit Points Deducted	Had Crops Rejected	Had Acreage Excluded for Growing
Due to Wildlife	29.3%**	36.0%**	25.3%**	29.3%**
Due to Non-Crop Vegetation	21.3%**	22.7%**	NS	21.3%**
Due to Waterbodies	NS	25.3%**	NS	18.7%**

NOTE: When considering consequences respondents report, we must bear in mind that individuals that conduct in-field food safety audits or inspections do not have legal authority to require a grower to remove an environmental feature or exclude land from growing certain crops. Food safety professionals can advise that corrective action be taken to address an identified risk factor as a conditional requirement for a grower to be able to sell their produce.

In the area to write-in comments, a few individuals specifically cited that inconsistencies between shippers and other food safety programs make it difficult to operate.

The survey found that Grower-shippers and Grower-packers (compared to Growers) may be under more pressure from Buyer's or Private 3rd Party Auditors/Inspectors. Grower-shippers were significantly more likely to have experienced consequences based on the presence of wildlife, non-crop vegetation or waterbodies by their Buyer's or Private 3rd Party Auditor/Inspector using both the LGMA Metrics (38.5%* compared to 21.1% of respondents that are not grower-shippers) and Other Food Safety Programs (38.5%** compared to 18.8% of respondents that are not grower-shippers).

A combined group of Grower-shippers or Grower-packers (to correspond to the "packer/shipper" buyer category in Q6) were significantly more likely to have experienced consequences based on the presence of wildlife, non-crop vegetation or waterbodies by their Buyer's or Private 3rd Party Auditor/Inspector using the LGMA Metrics (34.1%* compared to 20.0% of respondents that are not packer/shippers). There was no significant difference in the likelihood of Grower-shippers or Grower-packers to have experienced consequences by their Buyer's or Private 3rd Party auditor/inspector using Other Food Safety Programs.

These results suggest that much of the pressure being placed on growers by their shippers or packers is in fact pressure originating from higher-level buyers (such as processors or national/international buyers) being funneled through packer/shippers.

Processors or National/International Buyers

We reiterate here that there is some ambiguity with the wording of the category "National/International buyers" that limits our understanding and interpretation of these survey results. "National/international buyers" could mean grocers or food service as well as any other company that buys or sells produce on a national or international level.

Respondents who sell to processors were more likely to have been told the following *were food safety risks*:

- Wildlife (91.2%** compared to 35.0% of respondents who don't sell to processors);
- Non-Crop Vegetation (55.9%** compared to 17.5% of respondents who don't sell to processors); and
- Waterbodies (61.8%** compared to 21.7% of respondents who don't sell to processors)

Respondents who sell to national/international buyers were more likely to have been told the following *were food safety risks*:

- Wildlife (84.6%** compared to 44.0% of respondents who don't sell to national/international buyers);
- Waterbodies (61.5%** compared to 27.7% of respondents who don't sell to national/international buyers)

OFSP respondents (n=92) who sell to either processors or national/international buyers (compared to those who don't) reported being told by their auditors/inspectors/others using Other (Non-LGMA) Food Safety Programs with greater frequency that all categories of environmental features were risks to food safety. When compared to OFSP respondents that do not sell to processor or national/international buyers, those who sell to these companies were significantly more likely to have been told the following environmental features are risks to food safety: birds; rodents; amphibians; hedgerows or windbreaks; irrigation reservoirs; sediment and stormwater basins; and tailwater or other farm ponds (Table 7, 8, 9).

TABLE 7. Animals Indicated as a Risk to Food Safety: OFSP Respondents that Sell to Processors or National or International Buyers

	% of OFSP Respondents who <u>Sell to Processors or National/International Buyers</u> Told Animals were Risks	% of OFSP Respondents who <u>Do Not Sell to Processors or National/International Buyers</u> Told Animals were Risks
Feral Pig	18.8%	11.7%
Deer	28.1.%	15.0%
Birds	43.8%**	16.7%
Rodents	46.9%**	18.3%
Amphibians (e.g. frogs)	28.1%*	11.7%
Other	18.8%	5.0%

TABLE 8. Non-Crop Vegetation Indicated as a Risk to Food Safety: OFSP Respondents that Sell to Processors or National or International Buyers

	% of OFSP Respondents who <u>Sell to Processors or National/International Buyers</u> Told Vegetation is a Risk	% of OFSP Respondents who <u>Do Not Sell to Processors or National/International Buyers</u> Told Vegetation is a Risk
Plants in Farm Ditch or Pond	28.1%	16.7%
Hedgerow or Windbreak	15.6%**	3.3%
Rangeland	21.9%	10.0%
Natural Land (not grazed)	18.8%	10.0%
Wetland or Riparian Plants	21.9%	10.0%
Other	3.1%	3.3%

TABLE 9. Waterbodies Indicated as a Risk to Food Safety: OFSP Respondents that Sell to Processors or National or International Buyers

	% of OFSP Respondents who Sell to Processors or National/International Buyers Told Waterbodies were Risks	% of OFSP Respondents who Do Not Sell to Processors or National/International Buyers Told Waterbodies were Risks
Irrigation Reservoir	31.3%*	13.3%
Sediment or Stormwater Basin (drains after storms)	18.8%*	6.7%
Tailwater or Other Farm Pond	31.3%**	5.0%
Agricultural Ditch	18.8%	11.7%
Stream, River or Wetland	18.8%	11.7%
Other	0.0%	0.0%

The survey does not allow us to distinguish which Other Food Safety Programs specifically are being used to determine the risk associated with environmental features. However, these data do suggest that food safety programs employed by Processors or National/International Buyers may be generating potential obstacles to co-management. Further investigation is required and, since companies' food safety programs are proprietary and often not available to the public, engagement by processors and national/international buyers will be important to address challenges to co-management.

LGMA respondents (n=56) who sell to either processors or national/international buyers (compared to those who don't) reported being told by their auditors/inspectors/others using the LGMA Metrics with greater frequency that all categories of environmental features were risks to food safety. When compared to LGMA respondents that do not sell to processor or national/international buyers, those who sell to these companies were significantly more likely to have been told the following environmental features were risks to food safety: feral pig; deer; birds; rodents; amphibians; hedgerows or windbreaks; natural lands (not grazed); wetland or riparian plants; sediment and stormwater basins; and tailwater or other farm ponds (Table 10, 11, 12).

TABLE 10. Animals Indicated as a Risk to Food Safety: LGMA Respondents that Sell to Processors or National or International Buyers

	% of LGMA Respondents who Sell to Processors or National/International Buyers Told Animals were Risks	% of LGMA Respondents who Do Not Sell to Processors or National/International Buyers Told Animals were Risks
Feral Pig	51.9%**	20.7%
Deer	70.4%**	37.9%
Birds	44.4%*	20.7%
Rodents	74.1%**	27.6%
Amphibians (e.g. frogs)	48.1%**	13.8%
Other	18.5%	13.8%

TABLE 11. Non-Crop Vegetation Indicated as a Risk to Food Safety: LGMA Respondents that Sell to Processors or National or International Buyers

	% of LGMA Respondents who Sell to Processors or National/International Buyers Told Vegetation is a Risk	% of LGMA Respondents who Do Not Sell to Processors or National/International Buyers Told Vegetation is a Risk
Plants in Farm Ditch or Pond	37.0%	24.1%
Hedgerow or Windbreak	18.5%**	0.0%
Rangeland	40.7%	24.1%
Natural Land (not grazed)	40.7%**	13.8%
Wetland or Riparian Plants	33.3%**	6.9%
Other	3.7%	6.9%

TABLE 12. Waterbodies Indicated as a Risk to Food Safety: LGMA Respondents that Sell to Processors or National or International Buyers

	% of LGMA Respondents who Sell to Processors or National/International Buyers Told Waterbodies were Risks	% of LGMA Respondents who Do Not Sell to Processors or National/International Buyers Told Waterbodies were Risks
Irrigation Reservoir	40.7%	27.6%
Sediment or Stormwater Basin (drains after storms)	33.3%*	10.3%
Tailwater or Other Farm Pond	48.1%**	13.8%
Agricultural Ditch	33.3%	13.8%
Stream, River or Wetland	37.0%	24.1%
Other	0.0%	0.0%

These data suggest that Processors or National/International Buyers may be generating potential obstacles to co-management based on use of the LGMA Metrics. Further investigation is required to better understand the mechanism by which these companies are exerting pressures. When you consider these findings with data reported above in sections C.4.a. and C.4.b., it appears that some of the pressures may be coming from Buyer or Private 3rd Party Auditors regardless of what food safety program they adhere to.

All respondents that sell to processors or national/international buyers were significantly more likely to have experienced consequences due to the presence of environmental features (Table 13, 14). Produce grown for handlers whose product is shipped nationally and worldwide may be consumed by large numbers of people, increasing the potential magnitude of a food safety outbreak. Increased handling of fresh produce from field to table may increase the opportunity for that product to potentially be contaminated or cross-contaminated. These realities of the produce distribution system and concerns with brand protection and liability may contribute to the heightened pressure reported by respondents who sell to processors and national/international buyers

TABLE 13 Consequences Reported by All Respondents that sell to Processors Due to Environmental Features

	Were Required to Exclude or Remove	Had Audit Points Deducted	Had Crops Rejected	Had Acreage Excluded for Growing
Due to Wildlife	35.3%**	44.1%**	32.4%**	38.2%**
Due to Non-Crop Vegetation	26.5%**	29.4%**	11.8%*	26.5%**
Due to Waterbodies	NS ³¹	NS	NS	29.4%**

NOTE: When considering consequences respondents report, we must bear in mind that individuals that conduct in-field food safety audits or inspections do not have legal authority to require a grower to remove an environmental feature or exclude land from growing certain crops. Food safety professionals can advise that corrective action be taken to address an identified risk factor as a conditional requirement for a grower to be able to sell their produce.

TABLE 14 Consequences Reported by All Respondents that sell to National/International Buyers Due to Environmental Features

	Were Required to Exclude or Remove	Had Audit Points Deducted	Had Crops Rejected	Had Acreage Excluded for Growing
Due to Wildlife	38.5%**	46.2%**	NS	NS
Due to Non-Crop Vegetation	NS	30.8%*	23.1%**	NS
Due to Waterbodies	NS	NS	NS	46.2%**

NOTE: When considering consequences respondents report, we must bear in mind that individuals that conduct in-field food safety audits or inspections do not have legal authority to require a grower to remove an environmental feature or exclude land from growing certain crops. Food safety professionals can advise that corrective action be taken to address an identified risk factor as a conditional requirement for a grower to be able to sell their produce.

These results suggest that further efforts toward understanding site-specific conditions and potential differences between different food safety programs or their interpretation may be fruitful toward successfully co-managing in-field food safety and environmental protection. In order to do this, those processor or national/international buyers that have developed proprietary food safety programs need to participate in educational forums and engage in dialogue with the agricultural community and natural resource professionals working to address co-management challenges.

C.5.b. Food Safety Professionals Influence Co-Management Efforts

This survey was not developed to be able to determine whether different food safety professionals, auditors or inspectors are consistent with their interpretation of food safety guideline documents. However, more than half (51.5%) of the LGMA respondents disagreed or strongly disagreed with the statement “*Other [non-CDFA] food safety auditors/inspectors are consistent in their interpretation of the LGMA Metrics and audit documents.*” Twenty-three percent (23.2%) LGMA respondents agreed with this statement and none strongly agreed. Twenty percent (19.6%) indicated they had no opinion.

Thirty percent (30.4%) of OFSP respondents disagreed or strongly disagreed with the statement “*Food safety auditors/inspectors are consistent in their interpretation of Other or Non-LGMA food safety program requirements and audit documents.*” Eighteen percent (18.4%) of the OFSP respondents agreed with this statement and none strongly agreed. Thirty-two percent (31.5%) indicated they had no opinion.

³¹ NS is used for non-significant results. In this example, respondents that sell to processors were *not* more likely than those who don't to have had crops rejected based on the presence of wildlife.

Relatively equal proportions of respondents reported experiencing consequences due to environmental features by their Own Food Safety Professional (27.9%) and Buyer's or Third Party Food Safety Auditor/Inspector (30.5%). This suggests that food safety professionals, whether one's own or a buyer's auditor, are similarly inclined to impose requirements that may trigger incompatibilities between food safety and environmental protection.

Results presented above in "C.4. Challenges to Co-Management: Considering Different Food Safety Programs" suggest, however, field level interpretations of some food safety programs as opposed to the requirements of the document may be more likely to place respondents in potential situations that inhibit efforts for co-management. Food safety professionals may be in a position to exert considerable influence on land management activities. Further investigation is needed to determine the extent to which in-field risk assessment and interpretation of food safety guidelines varies amongst food safety professionals.

D. On-The-Ground Consequence of Co-Management Challenges

The survey included a number of multiple choice questions for respondents to report when and what actions were taken in response to food safety concerns associated with environmental features, and when these actions were taken (Q12; Q13; Q17; Q21; Q25).

Once a food safety risk has been identified, growers need to take action to address that risk in order to be able to sell their produce. These corrective actions need to meet food safety program requirements, satisfy food safety auditors or inspectors, and be documented. In some cases auditors or inspectors may suggest or recommend specific actions. Most often growers must determine which actions to take that will sufficiently address the risk, be affordable and compatible with their production methods, and hopefully support their environmental protection goals. There is, however, insufficient science and few resources made available to growers to guide decision making.

Many actions taken by growers to minimize food safety risk on their farms have little or no environmental impact. This survey solicited information only about the actions thought to have the greatest potential to result in negative environmental impacts.

D.1. On-The-Ground Consequences: Practices to Address Food Safety Concerns

The potential environmental benefits and potential food safety risks or benefits associated with various conservation practices (and other environmental features) depend largely on site conditions, design, operation and maintenance, and placement in the landscape. In the absence of site-specific information, we make no presuppositions about the level of benefit or risk associated with these practices or features.

When evaluating the environmental impact of actions taken to address food safety concerns associated with environmental features, it is necessary to keep in mind that size and location of an operation are important factors. Proximity and connectivity of a ranch to sensitive habitats or animal populations of concern will have a huge influence on the potential environmental consequences of an action. The survey did not solicit information from respondents about their proximity or connectivity to sensitive habitats, which limits our ability to fully determine the environmental impacts actualized by the reported actions. The amount of acreage managed by respondents will also determine the potential scale of impact; a single large operation has the ability to impact significant amount of land compared to his smaller counterparts.

We must also consider whether these actions are “one-time” or “on-going”. One-time actions include actions such a removal of practices, removal of vegetation, or installation of structures such as fencing. On-going activities include trapping or hunting. Some actions could be one-time or on-going, but for the purposes of this report will be considered as one-time actions. These include fencing or bare ground buffers.

As a note, fence characteristics and permanence depends on the species that are being excluded with the fence. Deer fences are typically eight feet high and have a lifespan of many years, whereas fencing for amphibians is typically 2-3 foot tall silt fencing that has a lifespan of only a few years. Bare ground buffers can involve routine control of weeds, an activity that could be stopped at any time and the weeds would repopulate in a relatively short timeframe. Removal of woody vegetation such as trees and shrubs in order to establish a bare ground buffer could, depending on the species, take years for the vegetation to re-establish itself.

Most actions can be considered one-time activities throughout this section, and these actions are reported based on the *total* respondents who indicated taking that action in either “2007 or prior” or “2008 or later”. On-going activities, however, are reported based only on respondents that *currently* use these practices (indicated the action was taken in “2008 or later”).

D.1.a. Actions in Response to Food Safety Concerns and Wildlife

One-time actions reported used by respondents to address food safety concerns about wildlife expressed by auditors, inspectors or others were fencing (27.9%) and bare ground buffers (22.1%).

The most common on-going management activities reported by respondents (used currently) were poison or poison bait for rodents (17.5%) and hunting or shooting (14.9%). The California Department of Fish and Game issues depredation permits for game animals such as deer and feral pigs. California’s Central Coast has a large feral pig population, and increased hunting for feral pigs in response to food safety concerns will certainly benefit the environment by reducing the pig population.

Five percent (4.5%) of respondents reported they are currently using copper sulfate in irrigation reservoirs in response to food safety concerns expressed by auditors, inspectors or others associated with frogs or fishes and 2.6% indicated use of copper sulfate in other waterbodies for concerns associated with frogs. As discussed above, stringent quality standards have been established for irrigation water to protect food safety and we would expect to see more growers taking action in response to food safety concerns associated with irrigation reservoirs. While copper sulfate is commonly used to control algae in reservoirs, these data suggest that the use reported here are additional applications directly resulting from food safety concerns.

Six percent (5.8%) respondents indicated they had taken other actions for wildlife which include: trapping and monitoring bait stations and traps; bird and deer chasers; maintaining no standing water; and informing neighbors [of the potential food safety risks associated with their pets].

D.1.b. Actions in Response to Food Safety Concerns and Non-Crop Vegetation

The one-time actions most commonly reported by respondents to have been taken to address food safety concerns about non-crop vegetation expressed by auditors/inspectors/others were bare ground buffers (19.5%), removing vegetation from farm ponds and ditches (16.9%), and removing trees and shrubs (15.6%). A total of

13.0% respondents indicated use of fencing³² between non-crop vegetation and cropland. Ten percent (10.4%) of respondents indicated that they planted a different crop adjacent to non-crop vegetation. Three percent (2.6%) respondents indicated that they removed wetland or riparian vegetation.

D.1.c. Actions in Response to Food Safety Concerns and Waterbodies

The one-time actions most commonly reported by respondents to address food safety concerns about waterbodies expressed by auditors/inspectors/others were bare ground buffers (14.9%), fencing (14.9%), planting different crops adjacent to waterbodies (10.4%), and stopping use, draining or filling farm ponds or ditches (9.1%). Five percent (4.5%) of respondents indicated that they drained, diverted, or filled in a natural waterbody. Just one cooperators indicated what type of natural waterbody was impacted, stating ditches. Since the term ditch typically refers to a manmade agricultural drainage, this individual's response may have been more appropriate under the "farm pond or ditches" category. Three percent (2.6%) respondents indicated taking other actions to address food safety concerns about waterbodies which include: water testing, copper sulfate, discontinued use of irrigation reservoirs, and drained water from area.

D.1.d. Actions in Response to Food Safety Concerns and Conservation Practices

In response to food safety concerns expressed by auditors/inspectors/others, 11.7% of all respondents indicated that they had *removed* a conservation practice (one-time action). Practices removed include: vegetated roads, buffers and ditches/waterways; irrigation reservoirs, tailwater ponds and basins; compost, animal-based compost and manure; cover crops; and habitats. Grower-shippers (33.3%***) and Grower-packers (16.7%*) were significantly more likely than Growers (4.5%) to indicate they removed conservation practices. Respondents who sell to brokers (26.7%***) compared to 8.1% of respondents who do not sell to brokers), processors (26.5%***) compared to 7.5% of respondents who do not sell to processors), or national/international buyers (46.2%***) compared to 8.5% of respondents who do not sell to national/international buyers) were significantly more likely to have indicated that they removed a conservation practice in response to concerns expressed by auditors/inspectors/others.

In response to food safety concerns expressed by auditors/inspectors/others, 11.0% of all respondents indicated that they had *disabled or stopped using* a conservation practice (on-going action). Practices taken out of use or disabled include: vegetated buffers and ditches/waterways; irrigation reservoirs, tailwater ponds and basins; compost and manure; cover crops; areas of beneficial insect harborage; and cattle rotation on cropland. Respondents that sell to processors (23.5%***) were significantly more likely than those who don't (7.5%) to have indicated that they disabled or stopped using a conservation practice in response to concerns expressed by auditors/inspectors/others.

In response to food safety concerns expressed by auditors/inspectors/others, 5.2% of all respondents indicated that they had *postponed or cancelled* a conservation practice. Practices postponed or cancelled include: vegetated roadsides and waterways; erosion control; drip irrigation; and compost and animal-based compost. Grower-packers (16.7%*) were significantly more likely than Growers (4.5%) to indicate that they postponed or cancelled a conservation practice. Respondents who sell to processors (14.7%***) were significantly more likely than those who don't (2.5%) to have indicated that they postponed or cancelled a conservation practice in response to concerns expressed by auditors/inspectors/others.

³² Fencing is most commonly used to eliminate or deter the movement of animals, and its installation in response to food safety concerns expressed about non-crop vegetation most likely addresses concerns about animals associated with the vegetation.

D.2. On-The-Ground Consequences: Temporal Trends

For all of the actions taken to address concerns expressed by auditors/inspectors/others associated with environmental features, fewer survey respondents reported taking those actions since 2008 (as opposed to 2007 or prior). Figures 3, 4, and 5 present this temporal trend for wildlife, non-crop vegetation and waterbodies, respectively. Fewer respondents reported they removed, stopped use, or cancelled a conservation practice since 2008 (4.5%) than in 2007 or prior (20.8%).

FIGURE 3. Actions Taken for Wildlife Indicated as a Food Safety Risk

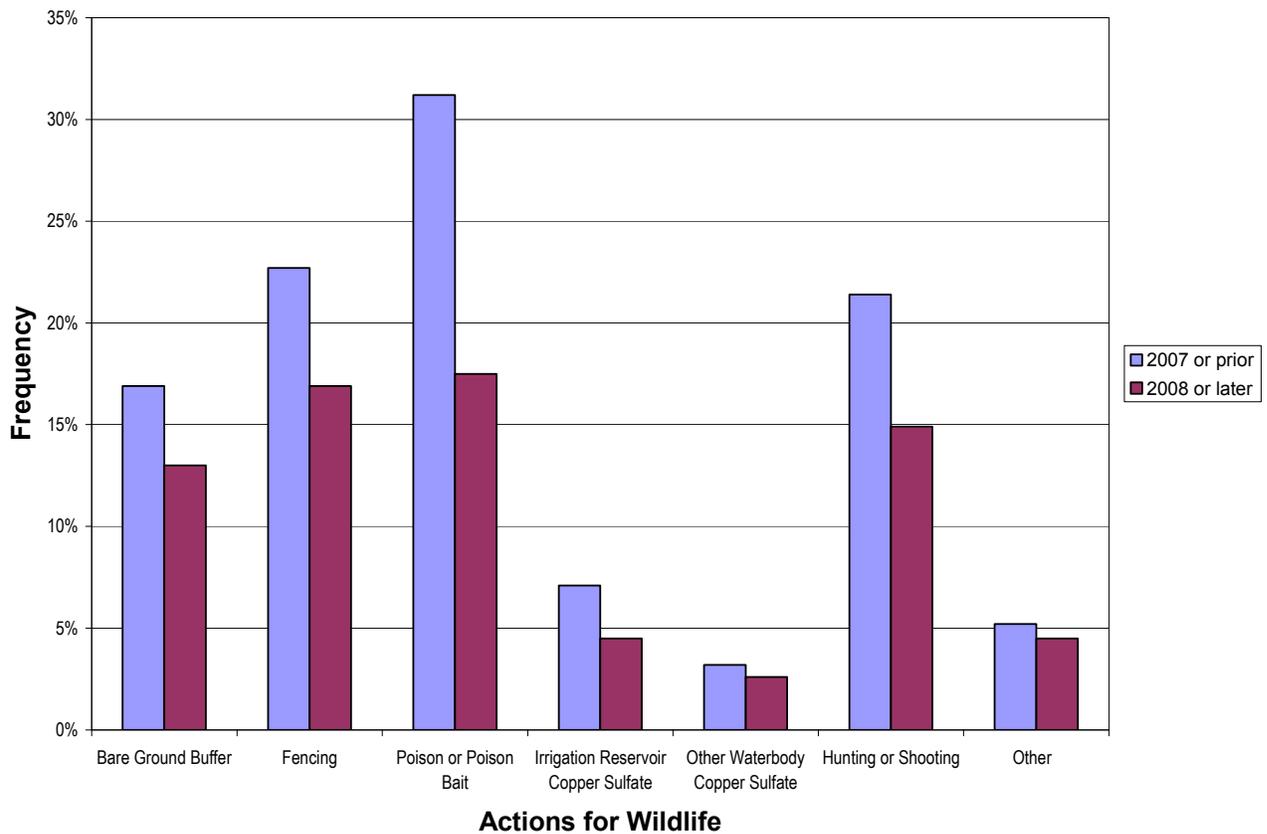


FIGURE 4. Actions Taken for Non-Crop Vegetation Indicated as a Food Safety Risk

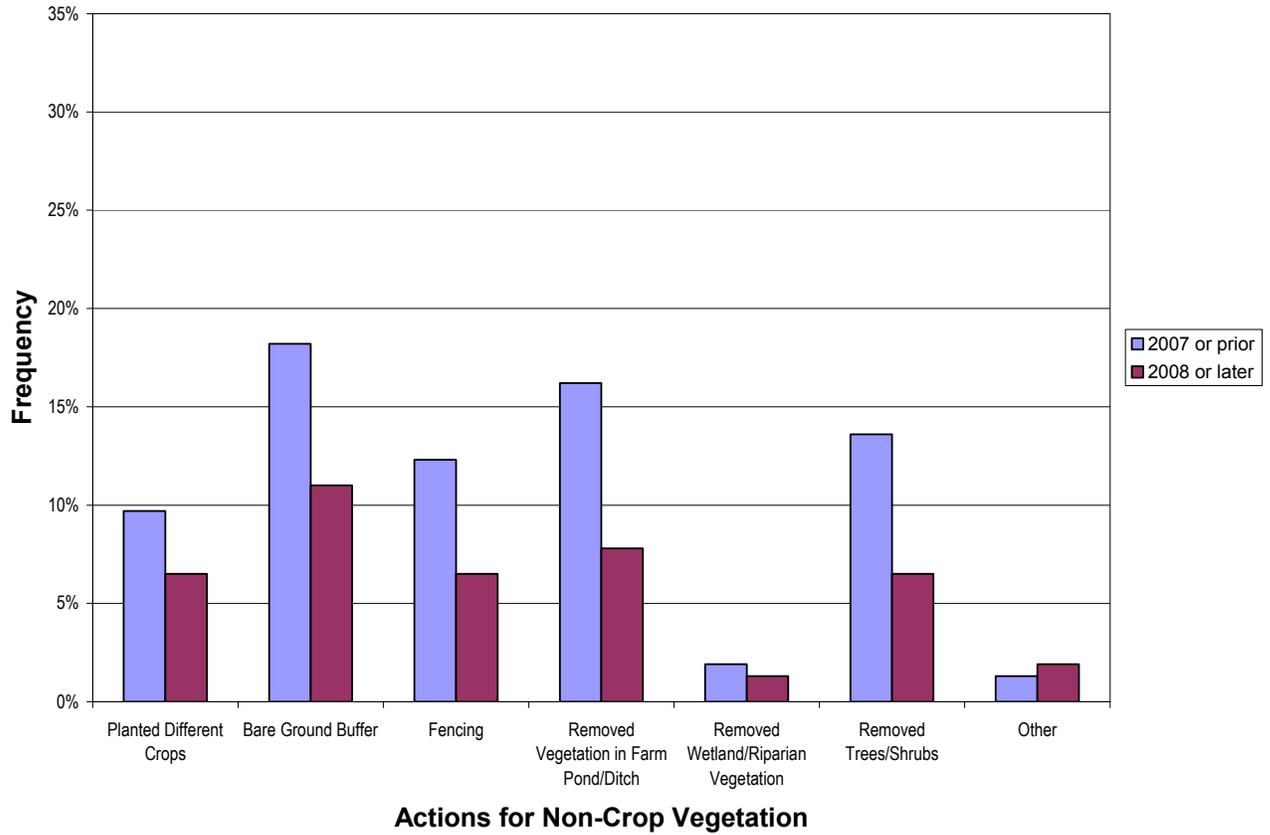
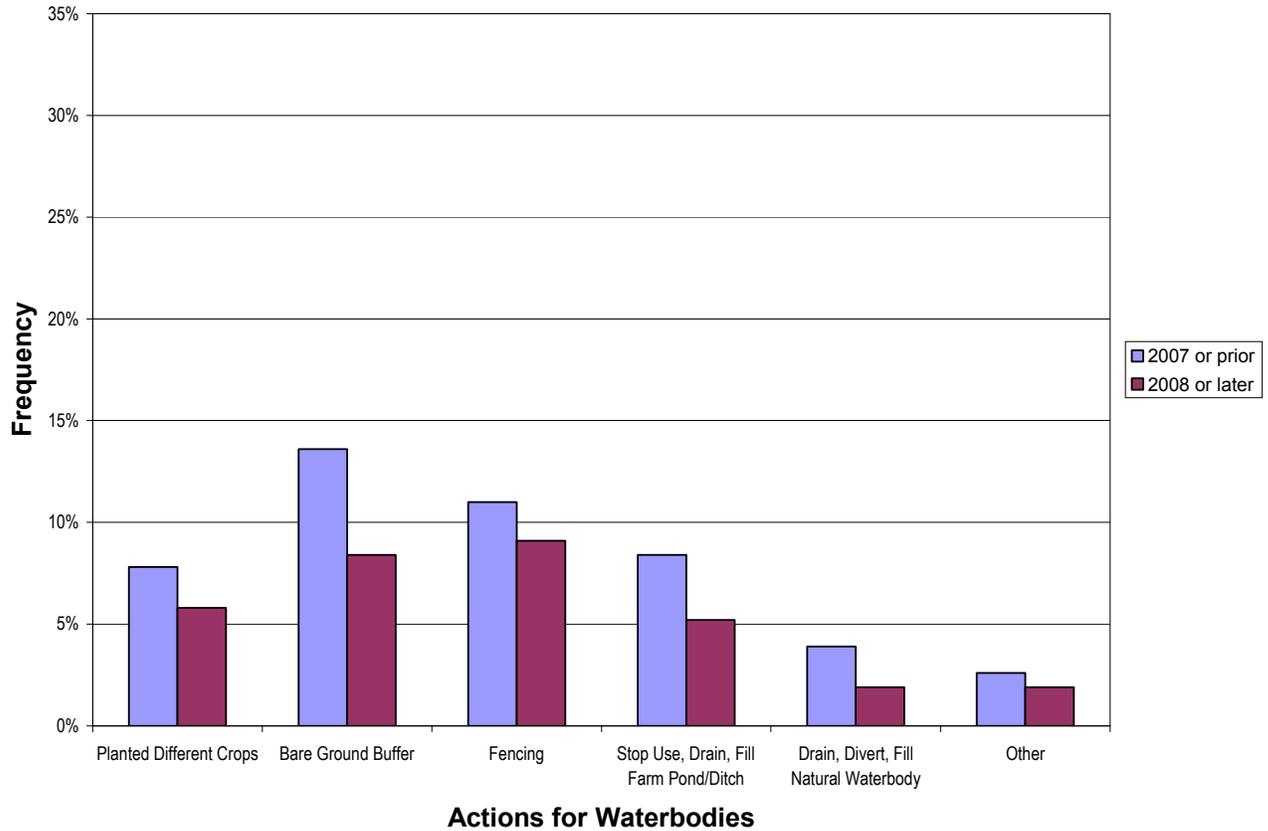


FIGURE 5. Actions Taken for Waterbodies Indicated as a Food Safety Risk



The data suggest there was a reduction in the use of the less environmentally sensitive practices. However, for one-time actions such as removal of conservation practices this temporal trend may be due to the fact that once removed there are fewer of these practices remaining on farms.

The in-field dynamic between food safety and environmental protection will continue to change as the agricultural community refines its approach to protecting food safety. One respondent described these changes for his operation. "It takes time to adjust to the new regulations. Land base for our farm is changing with termination of lease contracts. Land selection will reflect greater concern towards accommodating both food safety & environmental concerns in the near future."

It is important to consider whether or not the identification of food safety concerns in association with conservation practices and other environmental features may leave growers reluctant to adopt new practices to protect the environment. While this survey did not address changes in respondents' willingness to adopt new conservation practices, efforts to encourage co-management would benefit from investigating this topic further.

E. Economic Impacts and Financial Considerations of Co-Management Challenges

The survey asked a series of fill in the blank and multiple choice questions designed to solicit details about financial losses and costs incurred by respondents when they experienced in-field incompatibilities between food safety programs and environmental protection efforts (Q26; Q27; Q28). Some respondents provided additional information about financial costs or concerns related to co-management challenges in the space provided to write in additional comments (Q36).

It is important to note that this survey was not designed to capture detailed information about financial losses due to co-management challenges; it was designed to provide a general indication of the magnitude and variability of these costs.

E.1. Economic Impacts of Co-Management Challenges: Direct and Indirect Costs

A total of 28.6% of respondents indicated they had crops rejected or excluded for growing certain crops due to food safety concerns with wildlife, non-crop vegetation, waterbodies, or conservation practices since 2007. Thirteen percent (13.0%) had a total of 1,540 acres crops rejected and 15.6% had a total of 2,529 acres excluded for certain crops due to food safety concerns expressed by individuals using the LGMA Metrics. Twelve percent (11.7%) had a total of 972 acres crops rejected and 8.4% had a total of 896 acres excluded for certain crops due to food safety concerns expressed by individuals using Other (Non-LGMA) Food Safety Programs.

Ten percent (10.4%) of respondents indicated that they planted a different crop adjacent to non-crop vegetation. For many operations, replacing high value crops such as leafy greens with other crops within a buffer distance from an environmental feature can result in considerable financial losses depending on the value difference of the crops. No-harvest-zones established around sites of animal intrusion also impact the financial burden of animal intrusion. Animal movement is difficult to control, yet growers are incurring the costs when crops are rejected due to animal intrusion. Growers who are subject to food safety programs that require larger buffers than others are at a disadvantage.

Nearly twenty-eight percent (27.9%) of respondents provided an estimate of the cost or financial losses incurred due to food safety concerns with wildlife, non-crop vegetation, waterbodies, or conservation practices over the past 5 years. Total estimated losses were more than \$920,000 per year with a high of \$100,000 per year and low of \$340 per year. The mean losses were \$21,472 per year and the median loss was \$10,000 per year. Again, this survey was not designed to capture accurate, detailed information about costs related to challenges to co-managing for food safety and conservation; it was designed to provide a general indication of the magnitude and variability of these costs.

In addition a number of respondents expressed their concerns about the financial implications (both direct and indirect) of food safety programs and, in particular, apparent incompatibilities with environmental protection efforts. Direct costs indicated (not represented elsewhere in the survey) included risk of bankruptcy to a company in the event of a food safety incident and lost sales due to food safety scares. One respondent that owns land expressed frustration "...being caught in the middle, and losing money"; he decided to quit farming and rent out his land, instead. Another respondent reported losing sales because he "...refuse[s] to sign the LGMA and then remove conservation measures..."

Despite these losses, only 3.9% of the respondents reported that they received some form of payment, reimbursement, or other compensation to off-set these losses. As indicated by respondents, growers seem to be bearing the majority of costs associated with losses due to *in-field incompatibilities between food safety and environmental protection efforts*.

E.2. Economic Impacts of Co-Management Challenges: Economies of Scale

Any strategy to address potential impacts of new rules, regulations or resulting disagreeing demands between these may benefit from considering potential differential hardships that may result from economies of scale advantages of larger operations. Economies of scale are the cost advantages that a business obtains due to expansion. They are factors that cause a grower’s average cost per unit to fall as scale is increased. Economies of scale is a long run concept and refers to reductions in unit cost as the size of a operation, or scale, increases³³.

Reported annual per acre spending on in-field food safety and conservation, and annual per acre financial losses as a result of identified food safety risks associated with environmental features *decreases* as operation size *increases* (Table 15). Again, this survey was not designed to capture detailed cost or financial loss information.

Table 15. Per Acre Costs³⁴ for Food Safety, Environmental Protection, and Co-Management Challenges

		Annual Per Acre Spending: In-Field Food Safety ³⁵ (n=90)	Annual Per Acre Spending: Conservation ³⁶ (n=78)	Annual Per Acre Losses: Due to Incompatibility ³⁷ (n=42)
Small operations (< 100 acres)	Mean	\$93	\$117	N/A
	Median	\$33	\$90	
Medium operations (100 – 999 acres)	Mean	\$33	\$33	\$32
	Median	\$17	\$11	\$20
Large operations (≥1000 acres)	Mean	\$15	\$19	\$8
	Median	\$8	\$6	\$6

Total reported spending/losses were higher for larger operations. However, the spending/losses reported by smaller operations represented a higher percentage of their potential revenue. This trend suggests that economies of scale may be a relevant factor placing smaller operations at a disadvantage and potentially increasing their financial susceptibility to costs associated with increasing regulations and challenges to co-management of food safety and environmental protection.

³³ Sullivan, A. and S.M. Sheffrin (2003). Economics: Principles in Action. Upper Saddle River, New Jersey 07458: Pearson Prentice Hall. Pp. 157.

³⁴ Per acre values were calculated by dividing total spending/losses reported by the total acres owned or operated by the respondent.

³⁵ Respondents were asked to estimate total spent on in-field food safety protection in the *past 5 years*.

³⁶ Respondents were asked to estimate total spent on conservation practices in the *past 10 years*.

³⁷ Respondents were asked to estimate costs and financial losses incurred due to food safety concerns over environmental features in the *past 5 years*.

V. CONCLUSIONS

The results of this survey point to seven main conclusions.

1. *Certain Operations Were More Likely to Encounter Obstacles to Co-Management:* Leafy green growers operating large acreages were the most likely to encounter potential obstacles to co-management. Large and medium sized operations grow and sell the majority of fresh produce and may be more susceptible to market driven intolerance for environmental risks. However, the impact was being felt by growers of other crops including strawberries, artichokes and Brussels sprouts. Conventional growers were more likely to experience incompatible pressures between food safety and environmental protection. However, some organic-only operations were encountering obstacles to adhering to both food safety program requirements and certain organic standards.
2. *Certain Types of Companies that Buy Fresh Produce Have a Strong Effect on Co-Management:* The survey found that respondents selling to processors or national or international buyers were most likely to encounter potential obstacles to co-management; they also experienced significantly more consequences as a result. Respondents selling to grower-shippers were also encountering obstacles to co-management, but the survey suggests that some of these requirements were coming from higher-level buyers such as processors and national/international buyers to whom grower-shippers sell. Companies higher up on the distribution chain (processing or retail) are under more direct pressure from consumers. If associated with a food safety outbreak their visibility and potential liability is enormous.
3. *Food Safety Program Requirements Present Obstacles to Co-Management:* Because growers often sell their crops to multiple buyers, most now face meeting at least one if not several different sets of food safety requirements in order to sell their crop. The reality of adhering to many different food safety program guidelines leave growers in the position of having to reconcile potentially inconsistent requirements between different food safety programs as well as address requirements that may be contradictory to environmental protection efforts. Approximately half of the LGMA respondents and forty-percent of respondents adhering to other (Non-LGMA) food safety programs indicated that food safety programs were not fully compatible with efforts to protect water quality and the environment. Efforts have been made to incorporate environmental considerations into the LGMA Metrics. However, respondents adhering to the Metrics were confronted with potential obstacles to co-management. Based on the pressure being felt by respondents that sell to processors or national/international buyers, it seems likely that some company-specific food safety program requirements may be generating significant obstacles to co-management. The multitude of private company food safety programs presents significant challenges to co-management. Without engagement in dialogue by these private companies, it is impossible to determine to what degree any individual program may be inhibiting co-management efforts.
4. *Food Safety Professionals Conducting In-Field Audits Have a Strong Effect on Co-Management:* Depending on the size and type of operation, a grower may conduct self-audits as well as undergo food safety inspections and audits from the California Department of Food and Agriculture, processors, grower-shippers, buyer or third-party auditors representing companies that purchase a grower's product. Different food safety professionals may have different field interpretations of the Metrics or other company-specific food safety program guidelines. Approximately half of the LGMA respondents and one-third respondents that adhere to other (Non-LGMA) food safety programs indicated that food safety auditors or inspectors (with the exception of CDFA inspectors) were not consistent interpreting food safety guidelines documents during field inspections. Respondents that sell to processors or national/international buyers were more likely to experience requirements from their Buyer or a Private

3rd Party Auditor that were potentially contrary to co-management than those who do not sell to these types of companies. Auditor (excluding CDFA auditors) interpretation of the Metrics also seemed to be a contributing factor.

5. *Native Wildlife, Habitats, & Conservation Practice Are Impacted by Co-Management Challenges:*
Incompatibilities between in-field food safety and environmental protection efforts, and subsequent actions to address food safety concerns associated with environmental features have the potential to result in negative environmental impacts. As a condition to sell their produce, many respondents were required to exclude wildlife, remove vegetation and waterbodies, or had acreage excluded for growing certain crops to address potential food safety risks associated with these features. The wild animals most commonly associated with food safety risks were deer and rodents. Food safety risks were commonly associated with natural habitats including natural lands (not grazed) and stream, rivers and wetlands. In response to food safety concerns some respondents removed and disabled conservation practices, removed vegetation and established bare ground buffers, and were taking measures to exclude or eliminate native wildlife.
6. *Respondents were Investing Significant Resources for Food Safety and Environmental Protection:*
Respondents reported spending a combined total of more than \$1.4 million per year on conservation practices over the past decade and more than \$1.6 million per year on in-field food safety over the past five years. The majority of respondents had implemented conservation practices; the most common practices were cover crops, sediment or stormwater basins, plant-based compost and grassed waterways.
7. *Growers are Incurring Financial Hardships of Increasing Regulations & Obstacles to Co-Management:*
Respondents seemed to be bearing the weight of the economic hardships arising from incompatibilities between in-field food safety requirements and efforts to protect the environment. Few operations that participated in this survey had received financial assistance to off-set the losses resulting from incompatibilities between these priorities. Costs for smaller operations were disproportionately higher than their larger counterparts on food safety, environmental protection and as a result of incompatibility between the two. This suggests that small operations may be more vulnerable to increasing costs associated with increasing regulatory demands.

This is a critical year for food safety. Consumer concerns are heightened and national legislative efforts to develop mandatory enforceable food safety standards are underway. Protecting the safety of fresh produce and public health is paramount. Wherever possible, these efforts should be compatible with environmental protection goals; we should strive to prevent potential increases in other human health risks as a result of environmental damage. Successful co-management of food safety and environmental protection necessitates that in-field food safety guidelines are science based, adaptive, consistent and effectively focused on high risk factors for leafy greens and other produce. Co-management is also dependent on the consistent, educated field interpretation of food safety guidelines by food safety professionals. Efforts to protect human health must employ strategies to minimize risk of crop contamination based on a reasonable expectation of what can be achieved in the typical production environment with today's technology.

There is no easy way to reconcile seemingly incompatible demands between some food safety requirements and environmental protection; and growers are stuck in the middle of increasing requirements and regulations. To achieve the goal of co-management for food safety and environmental protection, there must be open dialogue and collaboration amongst the agricultural industry (including handlers and buyers), food safety scientists and private companies, human health and environmental regulatory agencies, and environmental scientists and organizations.

ATTACHMENT 1

Cover Letter and Survey Questionnaire



Resource Conservation District
of Monterey County



Agricultural Commissioner



Dear Grower,

We need your help *once again* to find a balance between food safety goals and resource conservation on the Central Coast. Enclosed, please find a **confidential survey** developed by a collaborative partnership of industry associations, conservation organizations, and your local Agricultural Commissioner's office. Results from the survey will be used to help us accurately communicate on a local and national level the challenges growers face in co-managing food safety and natural resource protection. Please take time to complete this important survey.

This is a critical year for food safety. Consumer concerns are heightened, national legislative efforts to develop mandatory, enforceable standards are underway, and growers are increasingly pressured to make tough choices between an array of food safety requirements and other regulatory obligations. Despite these challenges, we have an important opportunity to ensure that the growers' and landowners perspectives are considered in the food safety decisions that are being made.

The goals of the survey are three-fold:

- ⇒ Better understand and communicate growers' challenges regarding the relationship between food safety guidelines and agricultural management practices to protect natural resources. Your participation will give us critical insights into the current situation and insure the results are accurate and ground tested so we can work proactively with industry and decision makers.
- ⇒ Integrate survey findings into a report that will be presented to legislators and decision-makers. The report will outline potential conflicts between food safety standards, water quality regulations and resource conservation activities to facilitate informed decisions by both industry and government .
- ⇒ Support industry's efforts to develop in-field food safety guidelines that are science based, adaptive, consistent and effectively focused on high risk factors for leafy greens and other produce .

This survey is sponsored by the Resource Conservation District of Monterey County, Monterey County Agricultural Commissioner's Office, Grower-Shipper Association of Central California, Central Coast Agricultural Water Quality Coalition, Western Growers Association and The Nature Conservancy. Funding for this survey is provided by The Nature Conservancy through an agreement with the Produce Safety Project at Georgetown University. *The Resource Conservation District of Monterey County will maintain ownership of all the data. All responses are completely anonymous to protect your confidentiality. Survey findings will be reported in the aggregate only.*

Your time is valuable and we appreciate your effort to complete this survey. Please feel free to skip any questions you prefer not to answer.

Return your completed questionnaire to the Resource Conservation District of Monterey County using the enclosed postage-paid envelope by May 15, 2009.

Sincerely,

Paul Robins, Executive Director
Resource Conservation District of Monterey County

Eric Lauritzen, Agriculture Commissioner
Monterey County

Kay Mercer, Executive Director
Central Coast Agricultural Water Quality Coalition

Jim Bogart, President & General Counsel
Grower-Shipper Association

Hank Giclas, Vice President of Science & Technology
Western Growers Association

Chris Fischer, Monterey Project Director
The Nature Conservancy

QUESTIONS?

**Please contact
Melanie Beretti
RCDMC**

831.262.1199

SECTION I. OPERATION & BUSINESS INFORMATION

1. What crop(s) do you grow? (check all that apply)

- | | |
|--|--|
| <input type="checkbox"/> Baby Greens | <input type="checkbox"/> Green Onions |
| <input type="checkbox"/> Leaf Lettuce | <input type="checkbox"/> Broccoli |
| <input type="checkbox"/> Spinach | <input type="checkbox"/> Celery |
| <input type="checkbox"/> Head Lettuce | <input type="checkbox"/> Cauliflower |
| <input type="checkbox"/> Chard | <input type="checkbox"/> Culinary Herbs |
| <input type="checkbox"/> Kale | <input type="checkbox"/> Carrots |
| <input type="checkbox"/> Cabbage | <input type="checkbox"/> Brussel Sprouts |
| <input type="checkbox"/> Artichokes | <input type="checkbox"/> Cane berries |
| <input type="checkbox"/> Strawberries | |
| <input type="checkbox"/> Other, please specify _____ | |

2. How many acres do you own or rent to grow crops?

Own: _____ Rent: _____

3. How many irrigated crop acres did you harvest in 2008?

_____ Acres

4. What is your operation's role handling produce? (check all that apply)

- | | |
|----------------------------------|--|
| <input type="checkbox"/> Grower | <input type="checkbox"/> Wholesale distributor |
| <input type="checkbox"/> Shipper | <input type="checkbox"/> Processor |
| <input type="checkbox"/> Packer | <input type="checkbox"/> Other, specify _____ |

5. How would you classify your operation?

- Conventional Organic Both

6. Who do you sell your produce to? (check all that apply)

- Farmers market or CSA
 Broker
 Packer/Shipper
 Processor
 Wholesale distributor
 Local/Regional grocers or food service
 National/International buyers
 Other, please specify _____

7. Which of the following guidelines do you adhere to? (check all that apply)

- Signatory on Leafy Green Marketing Agreement
 Commodity Specific Food Safety Guidelines for Lettuce and Leafy Greens accepted by the Leafy Green Marketing Agreement Board ("LGMA Metrics")
 Your Own Food Safety Program
 Private Consulting Firm's Food Safety Program
 Buyers' Food Safety Program
 Organic Certification Standards
 Not applicable to operation
 Other, please specify _____

8. Approximately how much have you spent on in-field food safety protection over the past 5 years?

Estimated \$ _____ on in-field food safety in past 5 years

SECTION II. FOOD SAFETY AND CONSERVATION PRACTICES

9. Have you adopted any conservation practices on land that you farm?

- No ⇒ Go to Page 2, Question 14
 Yes

10. Approximately how much have you spent on conservation practices in the past 10 years?

Estimated \$ _____ on conservation in past 10 years

11. Which of the following conservation practices have you adopted on land you farm? (check all that apply)

- | | | |
|---|---|--|
| <input type="checkbox"/> Constructed wetland | <input type="checkbox"/> Vegetated treatment system | <input type="checkbox"/> Vegetated filter or buffer strips |
| <input type="checkbox"/> Cover cropping | <input type="checkbox"/> Compost (animal-based) | <input type="checkbox"/> Compost (plant-based) |
| <input type="checkbox"/> Grassed waterways | <input type="checkbox"/> Riparian/stream bank restoration | <input type="checkbox"/> Hedgerow or windbreak |
| <input type="checkbox"/> Tailwater recovery ponds | <input type="checkbox"/> Sediment or stormwater basin | <input type="checkbox"/> Other, specify: _____ |

12. Regarding conservation practices: In response to food safety concerns expressed by auditors/inspectors/others, I have adopted the following measures: (check all that apply)

- Not taken any action
 Removed a practice, specify type: _____
 Stopped using or disabled a practice, specify type: _____
 Postponed or cancelled a practice, specify type: _____
 Plan to remove, stop use or disable a practice, specify type: _____
 Other, specify type _____

13. When did you remove, stop use or cancel a conservation practice as described in Question 12? (check all that apply)

- Not applicable 2007 or prior 2008 or later

14. Regarding food safety and *wildlife* in or near fields: Auditors, inspectors or others have: (check all that apply)

Never indicated wildlife is a risk to food safety----- ⇒Go to Page 3, Question 18
 Indicated that wildlife is a risk to food safety: -----

15. Which animals were indicated as a risk to food safety by auditors/inspectors/others? (check all that apply)

	Concern from LGMA Metrics*	Concern from Other or Non-LGMA Program
Feral Pigs _____	<input type="checkbox"/>	<input type="checkbox"/>
Deer_____	<input type="checkbox"/>	<input type="checkbox"/>
Birds _____	<input type="checkbox"/>	<input type="checkbox"/>
Rodents _____	<input type="checkbox"/>	<input type="checkbox"/>
Amphibians (e.g. frogs) _____	<input type="checkbox"/>	<input type="checkbox"/>
Other, <i>specify</i> _____	<input type="checkbox"/>	<input type="checkbox"/>

16. If auditors/inspectors/others indicated *wildlife* is a food safety risk, please detail below: (check all that apply)

	Required I exclude it	Deducted audit points	Rejected crops	Excluded land for growing	Other
SOURCE OF WILDLIFE CONCERN					
<u><i>Using LGMA Metrics</i></u>					
Your Food Safety Professional	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Buyer or Private 3 rd Party Auditor/Inspector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CA Dept. of Food & Agriculture Inspector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other, <i>specify</i> : _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<u><i>Using Other or Non-LGMA Program</i></u>					
Your Food Safety Professional	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Buyer or Private 3 rd Party Auditor/Inspector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Organic Inspector/ Auditor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other, <i>specify</i> : _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

17. In response to concerns described in questions 15 & 16, what have you done to address *wildlife*? (check all that apply)

	2007 or prior	2008 or later
Not taken any action _____	<input type="checkbox"/>	<input type="checkbox"/>
Bare ground buffer for wildlife _____	<input type="checkbox"/>	<input type="checkbox"/>
Fencing for wildlife _____	<input type="checkbox"/>	<input type="checkbox"/>
Poison or poison bait for rodents _____	<input type="checkbox"/>	<input type="checkbox"/>
Copper sulfate for frogs/fish ~ irrigation reservoir _____	<input type="checkbox"/>	<input type="checkbox"/>
Copper sulfate for frogs ~ other waterbody _____	<input type="checkbox"/>	<input type="checkbox"/>
Hunting or shooting _____	<input type="checkbox"/>	<input type="checkbox"/>
Other, <i>specify</i> : _____	<input type="checkbox"/>	<input type="checkbox"/>

*NOTE: LGMA Metrics = Leafy Green Marketing Agreement Board accepted Commodity Specific Food Safety Guidelines for Lettuce and Leafy Greens

18. Regarding food safety & non-crop vegetation in or near fields: Auditors, inspectors or others have: (check all that apply)

Never indicated non-crop vegetation is a risk to food safety----- ⇒Go to Page 4, Question 22
 Indicated that non-crop vegetation is a risk to food safety: -----

19. Which type of non-crop vegetation was indicated as a risk to food safety by auditors/inspectors/others? (check all that apply)

	Concern from LGMA Metrics*	Concern from Other or Non-LGMA Program
Plants in Farm Ditch or Pond _____	<input type="checkbox"/>	<input type="checkbox"/>
Hedgerow or Windbreak _____	<input type="checkbox"/>	<input type="checkbox"/>
Rangeland _____	<input type="checkbox"/>	<input type="checkbox"/>
Natural Land (not grazed) _____	<input type="checkbox"/>	<input type="checkbox"/>
Wetland or Riparian Plants _____	<input type="checkbox"/>	<input type="checkbox"/>
Other, <i>specify</i> _____	<input type="checkbox"/>	<input type="checkbox"/>

20. If auditors/inspectors/others indicated non-crop vegetation is a food safety risk, please detail below: (check all that apply)

	Required I remove it	Deducted audit points	Rejected crops	Excluded land for growing	Other
SOURCE OF VEGETATION CONCERN					
<u><i>Using LGMA Metrics</i></u>					
Your Food Safety Professional	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Buyer or Private 3 rd Party Auditor/Inspector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CA Dept. of Food & Agriculture Inspector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other, <i>specify</i> : _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<u><i>Using Other or Non-LGMA Program</i></u>					
Your Food Safety Professional	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Buyer or Private 3 rd Party Auditor/Inspector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Organic Inspector/ Auditor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other, <i>specify</i> : _____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. In response to concerns described in questions 19 & 20, what have you done to address non-crop vegetation? (check all that apply)

	2007 or prior	2008 or later
Not taken any action _____	<input type="checkbox"/>	<input type="checkbox"/>
Planted different crops near non-crop vegetation _____	<input type="checkbox"/>	<input type="checkbox"/>
Bare ground buffer between vegetation & crop _____	<input type="checkbox"/>	<input type="checkbox"/>
Fencing between vegetation & crop _____	<input type="checkbox"/>	<input type="checkbox"/>
Removed vegetation from ditches or farm ponds _____	<input type="checkbox"/>	<input type="checkbox"/>
Removed wetland or riparian vegetation _____	<input type="checkbox"/>	<input type="checkbox"/>
Removed trees or shrubs _____	<input type="checkbox"/>	<input type="checkbox"/>
Other, <i>specify</i> _____	<input type="checkbox"/>	<input type="checkbox"/>

*NOTE: LGMA Metrics = Leafy Green Marketing Agreement Board accepted Commodity Specific Food Safety Guidelines for Lettuce and Leafy Greens

22. Regarding food safety and *waterbodies* in or near fields: Auditors, inspectors or others have: (check all that apply)

Never indicated a waterbody is a risk to food safety----- ⇒Go to Page 5, Question 26
 Indicated that a waterbody is a risk to food safety -----

23. Which type of waterbody was indicated as a risk to food safety by auditors/inspectors/others? (check all that apply)

	Concern from LGMA Metrics*	Concern from Other or Non-LGMA Program
Irrigation Reservoir-----	<input type="checkbox"/>	<input type="checkbox"/>
Sediment or Stormwater Basin (drains after storms)-----	<input type="checkbox"/>	<input type="checkbox"/>
Tailwater or Other Farm Pond -----	<input type="checkbox"/>	<input type="checkbox"/>
Agricultural Ditch-----	<input type="checkbox"/>	<input type="checkbox"/>
Stream, River or Wetland -----	<input type="checkbox"/>	<input type="checkbox"/>
Other, <i>specify</i> _____	<input type="checkbox"/>	<input type="checkbox"/>

24. If auditors/inspectors/others indicated *waterbodies* are a food safety risk, please detail below: (check all that apply)

	Required I remove it	Deducted audit points	Rejected crops	Excluded land for growing	Other
SOURCE OF <i>WATERBODY</i> CONCERN					
<u>Using LGMA Metrics</u>					
Your Food Safety Professional	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Buyer or Private 3 rd Party Auditor/Inspector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CA Dept. of Food & Agriculture Inspector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other, <i>specify</i> :_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<u>Using Other or Non-LGMA Program</u>					
Your Food Safety Professional	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Buyer or Private 3 rd Party Auditor/Inspector	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Organic Inspector/ Auditor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other, <i>specify</i> :_____	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

25. In response to concerns described in questions 23 & 24, what have you done to address *waterbodies*? (check all that apply)

	2007 or prior	2008 or later
Not taken any action -----	<input type="checkbox"/>	<input type="checkbox"/>
Planted different crops near waterbody -----	<input type="checkbox"/>	<input type="checkbox"/>
Bare ground buffer between waterbody & crop-----	<input type="checkbox"/>	<input type="checkbox"/>
Fencing between waterbody & crop -----	<input type="checkbox"/>	<input type="checkbox"/>
Stopped use, drained, or filled ditch or farm pond-----	<input type="checkbox"/>	<input type="checkbox"/>
Drained, diverted or filled in natural waterbody <i>Please specify type</i> :_____	<input type="checkbox"/>	<input type="checkbox"/>
Other, <i>specify</i> _____	<input type="checkbox"/>	<input type="checkbox"/>

*NOTE: LGMA Metrics = Leafy Green Marketing Agreement Board accepted Commodity Specific Food Safety Guidelines for Lettuce and Leafy Greens

SECTION VI. FINANCIAL IMPACTS

26. Estimate how many acres you have you had rejected or excluded for growing certain crops due to food safety concerns with wildlife, non-crop vegetation, waterbodies, or conservation practices.

LGMA Metrics Concerns Since 2007 _____ acres crop rejected _____ acres excluded

Other or Non-LGMA Program Concerns Since 2007 _____ acres crop rejected _____ acres excluded

27. Estimate the costs or financial losses you have incurred due to food safety concerns with wildlife, non-crop vegetation, waterbodies, or conservation practices.

Estimated \$ _____ losses/costs in past 5 years

28. Did you receive any payment, reimbursement or other compensation to off-set the losses described in Question 27? If yes, please describe.

- Not Applicable
No
Yes, please specify: _____

SECTION VII. OPINION

Please circle the word(s) that best describe your opinion of the following statements regarding pre-harvest activities.

29. The Leafy Green Marketing Agreement Board accepted Commodity Specific Food Safety Guidelines for Lettuce & Leafy Greens (LGMA Metrics) are fully compatible with water quality and environmental regulations.

Strongly Disagree Disagree No opinion Agree Strongly Agree

30. CA Department of Food and Agriculture auditors/inspectors are consistent in their interpretation of the LGMA Metrics and audit documents.

Strongly Disagree Disagree No opinion Agree Strongly Agree

31. Other food safety auditors/inspectors are consistent in their interpretation of the LGMA Metrics and audit documents.

Strongly Disagree Disagree No opinion Agree Strongly Agree

32. Other or Non-LGMA food safety program requirements are fully compatible with water quality and environmental regulations.

Strongly Disagree Disagree No opinion Agree Strongly Agree

33. Food safety auditors/inspectors are consistent in their interpretation of Other or Non-LGMA food safety program requirements and audit documents.

Strongly Disagree Disagree No opinion Agree Strongly Agree

34. I feel it is my responsibility to protect food safety on my farm?

Strongly Disagree Disagree No opinion Agree Strongly Agree

35. I feel it is my responsibility to protect water quality and the environment on my farm?

Strongly Disagree Disagree No opinion Agree Strongly Agree

36. Please write in the space below any additional comments about this survey or your experience trying to meet both food safety and environmental/water quality goals.

Empty rectangular box for additional comments.

(Use back of page if needed =>)

SECTION VIII. OPTIONAL INFORMATION

This optional information will help us better understand the survey results.

What is your job title? _____ How long with company? _____

Use this page if additional space is needed

QUESTIONS?

Contact Melanie Beretti, RCD Food Safety Program Director

831.262.1199

Melanie.Beretti@rcdmonterey.org

RETURN SURVEY BY MAY 15, 2009 USING THE SELF-ADDRESSED STAMPED ENVELOPE TO

Resource Conservation District of Monterey County

744 La Guardia Street, Building A

Salinas, CA 93905

**Challenges to Co-Management of Food Safety and Environmental Protection:
A Grower Survey
July 2009**



**Prepared by Melanie Beretti
Resource Conservation District of Monterey County
744 La Guardia Street, Building A
Salinas, CA 93905
www.rcdmonterey.org**