Policy Strategy to Reduce Erosion in the Elkhorn Slough Watershed

A Report to

California Coastal Commission
Central Coast District
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from

Timothy Belden
Robert Gramlich
Deborah Leland
Thomas Panella
Hang To

Graduate School of Public Policy
University of California, Berkeley

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ASCS	Agricultural Stabilization and Conservation Service
BMP	Best Management Practice
CNPCP	Coastal Nonpoint Source Pollution Control Program
CRMP	Coordinated Resource Management and Planning
CZARA	Coastal Zone Act Reauthorization Amendments
CZMA	Coastal Zone Management Act
DPW	Department of Public Works
EPA	Environmental Protection Agency
LCP	Local Coastal Program
NERR	National Estuarine Research Reserve
NPS	Nonpoint Source Pollution
PCA	Pest Control Advisor
SCS	Soil Conservation Service
USDA	US Department of Agriculture

I. EXECUTIVE SUMMARY

Elkhorn Slough is one of California's most valuable remaining estuaries, providing precious habitat for many rare and endangered species. Many of the slough's resources are threatened, both as a result of degraded water quality and sedimentation leading to loss of wetlands. Pollutants and sediment enter the slough from nonpoint sources, that is, via surface waters carrying runoff from surrounding lands. In the Elkhorn Slough watershed, a major source of nonpoint pollution is sedimentation caused by erosion from sloped hillsides, primarily hillsides on which strawberries are grown. Currently, erosion from strawberry farms comprises two-thirds of total sediment entering the slough.

Despite a twenty year history of legislation and the establishment of regulatory mechanisms to protect coastal resources and water quality, regulatory approaches to solving the problem of nonpoint source pollution are generally ineffective. Because nonpoint source pollution is dependent on land uses and varying land conditions (e.g., soil type and slope), and because it is "invisible" at its source, regulatory agencies have neither the information nor enforcement tools to require implementation of mechanisms to reduce nonpoint source pollution such as sedimentation in Elkhorn Slough. Furthermore, policies governing land use in California's coastal zone emphasize the importance of preserving prime and other productive farmland, further limiting regulatory alternatives for reducing sedimentation.

Our analysis of non-regulatory approaches suggests that these have greater potential than regulatory approaches for reducing soil erosion in the watershed. However, as the process stands, there are a number of barriers preventing or discouraging growers from implementing erosion control. These include a lack of information, insufficient incentives, poor communication with assistance agencies, insufficient capital availability for improvements and poor interagency coordination of efforts to reduce erosion. Since these barriers are very closely related to the social and cultural make-up of the farmers, we systematically account for these issues. We conclude that the non-regulatory approach would succeed if the barriers to the process could be overcome.

Our recommendations are specific solutions to each of the implementation barriers we identified. Table 1.1 lists the barriers and corresponding solutions which we believe would instill a desire to reduce erosion, provide information, streamline the application process for assistance, make credit available, and finally, achieve erosion control. Perhaps our most important new finding is that erosion control is not in the economic interest of the average farmer on highly erodible soil; they will need some form of assistance to reasonably expect a reduction in nonpoint source pollution in the Elkhorn Slough watershed.

Table 1.1. Summary of Erosion Control Implementation Barriers and Recommended Solutions

Step in Process	Barrier to Implementation	Recommended Solution
Desire to Reduce Erosion:		
• Public Works billing	• Public Works bills don't convey true social cost	• Improve billing system and increase penalties
• Environmental Awareness	• Growers not aware of full effects of erosion	• Increase grower awareness through better education
• Awareness of Assistance	• Grower costs exceed benefits	• Increase subsidies until benefits exceed costs
Gather Erosion Control Information	• Lack of information in appropriate form	• Increase information - translate to Spanish
	• Communication channels	• Hire growers to educate other growers
	• Multiple agencies	• Coordinate efforts
Secure Financing	• Current subsidy application process is burdensome	• Streamline application process
	• Limited credit opportunities	• Increase current and develop new credit sources
Achieve Erosion Control	• Multiple agencies involved with erosion control all with different objectives and problem definitions	• Coordinate agency communication and efforts for erosion control
		• Public Works remove sediment from roadside

II. RESOURCES OF THE ELKHORN SLOUGH WATERSHED

Elkhorn Slough is an estuarine system resulting from the mixing of seawater with fresh-water. Located near Moss Landing, California at the head of the Monterey Submarine Canyon, the slough is one of the few remaining wetlands in California and is considered by the California Department of Fish and Game to be "one of the most ecologically important estuarine systems in California".[1] Figure 2.1 shows Elkhorn Slough and its linkages with adjacent wetlands.

The Elkhorn Slough watershed contains the second largest salt marsh in California and provides critical wetland habitat for many endangered and threatened species including the Southern Marine Sea Otter, peregrine falcon, California brown pelican, California clapper rail, Western snowy plover, and the Santa Cruz long toed lizard. Over 90 species of birds are found in the slough, and it is an important stopping point along the California Flyway for migratory birds. The slough and harbor waters are a productive nursery and feeding area for many sport and commercial fish species. A diverse population of mud-dwelling and benthic organisms are found in the slough, and its mudflats were once used for commercial clamming. Numerous mammals and other vertebrae make the slough home. Since over two-thirds of California's coastal wetlands have been destroyed, the slough's environmental preservation is important to the continued existence of many wetland wildlife species.

The Elkhorn Slough watershed also serves an important educational and social role. The offshore submarine canyon is a highly regarded oceanographic research area. At least ten colleges and universities use the slough area for basic and advanced studies in biology, ecology, and marine biology. The slough has a visitor's center and nature trails which host thousands of elementary and secondary school children as well as the general public for interpretive nature programs. The slough attracts hikers, bird watchers, kayakers and fishermen who come to enjoy the peace and solitude or the recreation the slough provides.

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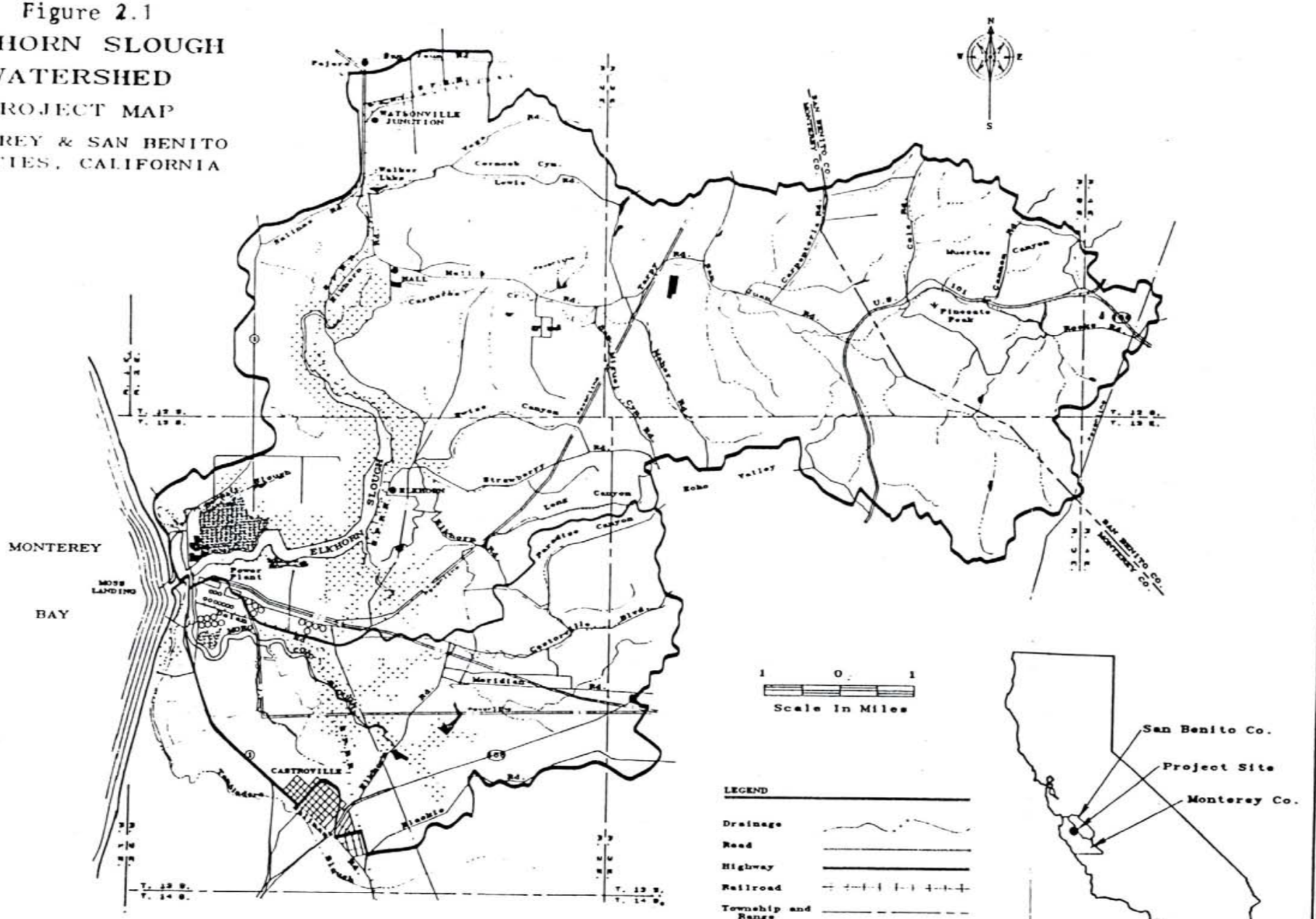
1 ABA Consultants. Elkhorn Slough Wetland Management Plan, prepared for California State Coastal Conservancy & Monterey County Planning Department, December 1989. p. xv.

Figure 2.1

ELKHORN SLOUGH WATERSHED

PROJECT MAP

MONTEREY & SAN BENITO COUNTIES, CALIFORNIA



U.S.D.A. - SOIL CONSERVATION SERVICE
DAVIS, CALIFORNIA

Elkhorn Slough is partially contained in the Monterey Bay National Marine Sanctuary administered by the California Coastal Commission and the National Oceanographic and Atmospheric Administration. Much of the slough's wetlands have been designated natural preserve and purchased by The Nature Conservancy and the California Department of Fish and Game.

Since Elkhorn Slough serves as the drainage channel to the ocean for its watershed, any pollution or alteration in another part of the watershed affects the slough. Over half the land remains as native vegetation, although much has been adapted for agriculture as well as for residential and commercial use. The dominant agricultural uses are pasture, artichoke crops, row crops, and berries, primarily strawberries.

III. ENVIRONMENTAL IMPACTS AND SOURCES OF SEDIMENT IN THE ELKHORN SLOUGH WATERSHED

A. IMPACTS OF SEDIMENT IN ELKHORN SLOUGH

The primary threat to the ecological health of the slough is nonpoint source (NPS) pollution in its watershed. Nationally, NPS pollution has been recognized as the cause of 75 percent of all pollution entering U.S. waterways. Elkhorn Slough has some of the highest soil erosion rates in the U.S.[2] and the environmental effects of this pollution are severe. Sediment drains off of farmland and makes its way through drainage channels and streams into the slough, filling in valuable salt marsh area (see Figure 3.1). Compounding the sediment damage, pesticides from farmland flows into the slough attached to sediment. These chemicals, which have been discovered in benthic organisms and birds, are toxic to to these organisms as well as to humans.

Wetlands adjacent to the slough have been reduced as a result of sediment deposition along their upper edges. Some parts of the wetlands are buried where gullies and streams deposit sediment. This is most significant in the Salicornia (pickleweed) marshes along the western and northern shore of Elkhorn Slough. The reduction in wetlands threatens the survival of rare and endangered species who make it their home. The chemical composition of water has been changed due to the sediment, resulting in the disappearance and reduction in productivity of some fish species. Furthermore, soil salinity has been changed due to sediment deposition. High salinity limits the ability of important commercial fish to spawn, threatening future economic losses from the fishing fleet at Moss Harbor. Sediment deposits also create mosquito breeding sites when they block watercourses.

Pesticides contained in sediment have also severely damaged the fisheries production in the slough. Many kinds of pesticides such as DDT, toxaphene, dieldrin, chlordane and endosulphan

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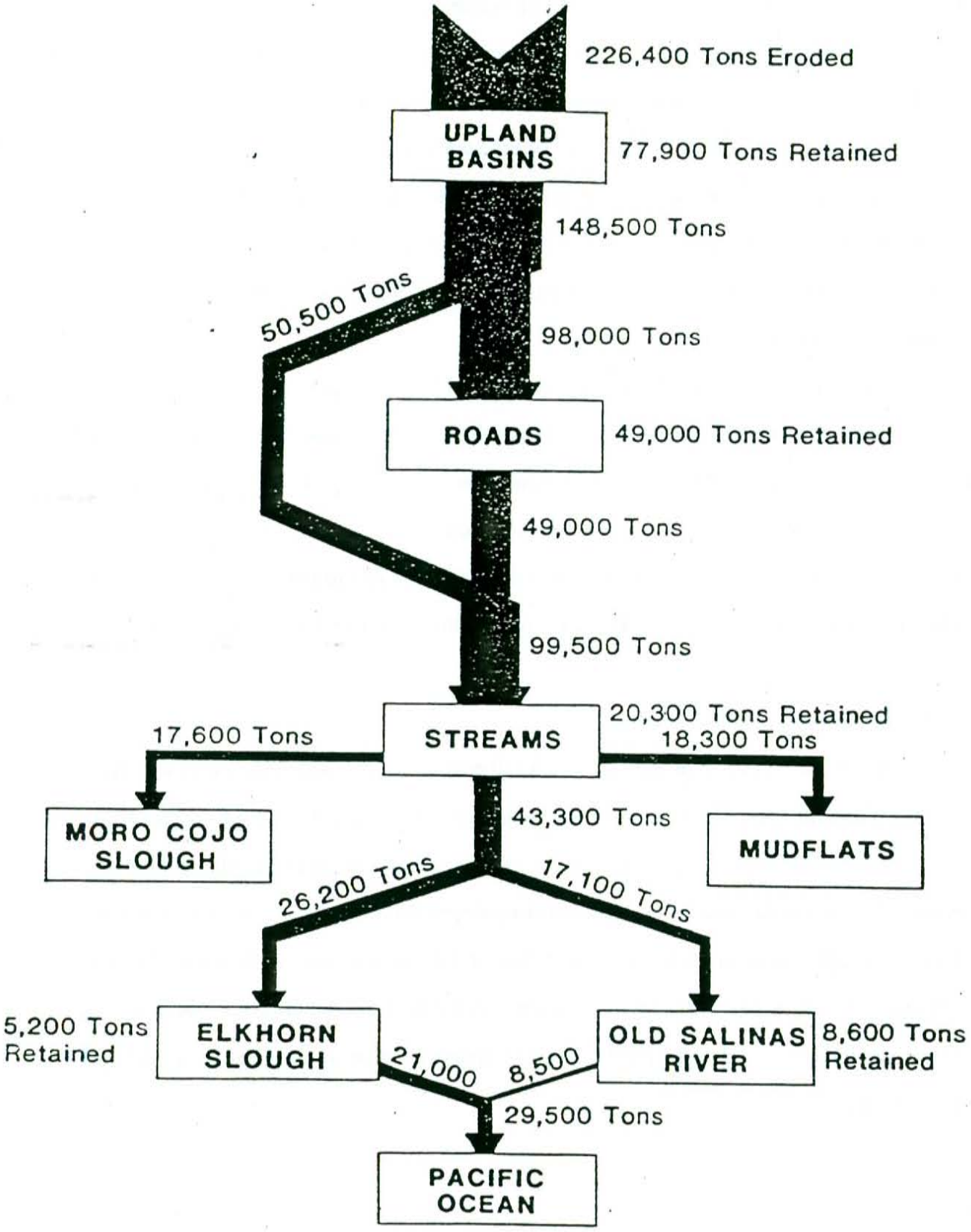
2 Measured in tons per acre. United States Department of Agriculture, Soil Conservation Service. Draft Watershed Plan and Environmental Assessment: Elkhorn Slough Watershed Project, Monterey and San Benito Counties, California, January 1994.

Figure 3.1 - **SEDIMENT ROUTING SCHEMATIC DIAGRAM**



were detected in Elkhorn Slough and its adjoining waterways. Thirty-six different insecticides, herbicides and fungicides that were used on strawberries in 1984 have been recently detected. As a result, the reproduction of birds has been decreased due to embryo deformity and reduction of egg hatchability, which finally results in reduction of the number of bird species in the slough. Although many of these chemical compounds have been abandoned, their effects remain today. Mussels from the Old Salinas River, which joins Elkhorn Slough at Moss Landing, were detected to contain high level of toxaphene, endosulphan and DDT. Heavy concentration of pesticides were also detected in fish and clams.

Luckily, from a policy standpoint, sedimentation and pesticide pollution come from the same source: soil erosion on farmland. If erosion is controlled, sediment does not flow into the slough and pesticides which are attached to sediment remain on the land as well. Moreover, pesticides remain on the soil for many years — DDT, banned years ago, is still found in watershed soils and streams. Thus, even if pesticide use were halted altogether, the environmental effects would still be primarily dependent on erosion levels. The solution therefore lies in reducing erosion.

B. SOURCES OF SEDIMENT

The relative contribution of sediment from soil erosion on different lands varies widely. Lands in agricultural use result in some of the highest erosion rates. Intensive agriculture has more than twice the erosion potential of urban development and nearly ten times that of sites with native vegetation.[3] In particular, agricultural land on steep slopes contributes much more to soil erosion. In Elkhorn Slough, strawberries are the crop grown on the steepest land. A shown by Table 3.1 and Figure 3.2, strawberry land is responsible for two-thirds of the soil erosion, despite its relatively small land area. This fact highlights the importance of strawberry land in any NPS policy solution.

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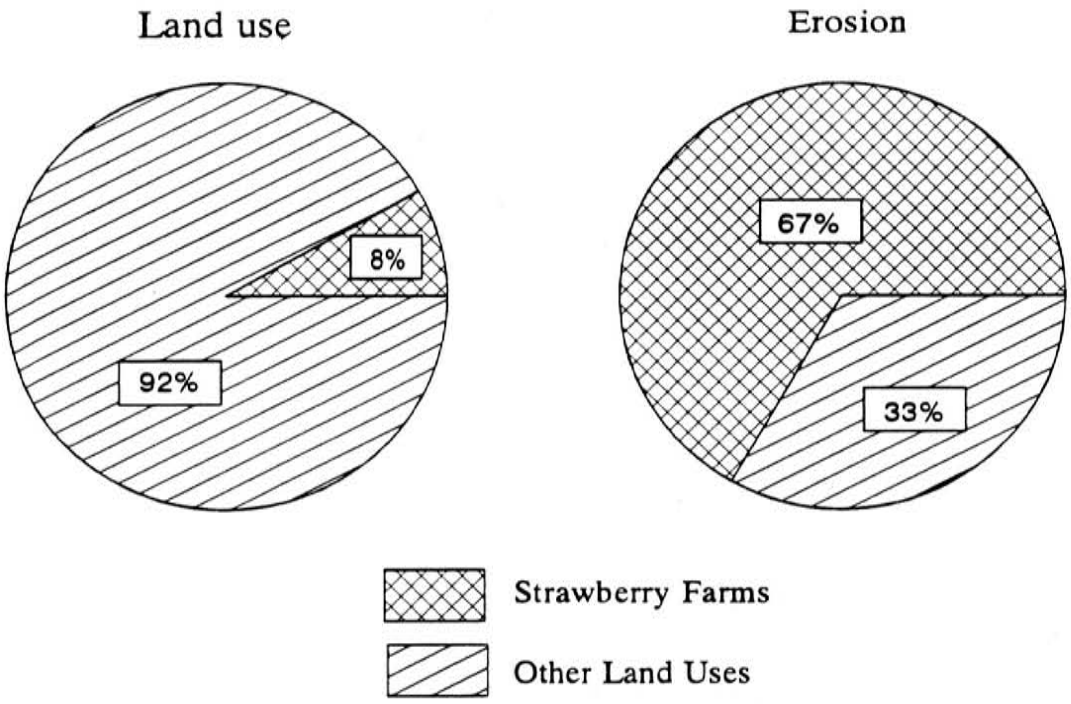
3 Monterey, County of. North County Land Use Plan (Final Draft), April 1993.

Table 3.1: Erosion Levels by Land Use

Land Use	*Acres*	*Marginal contribution*	*Total contribution*	*Percent of total*
		(tons/acre/year)	(tons/year)	
Native Vegetation	25,400	1	25,400	14.3
Pasture	400	3	1,200	0.7
Field crops	300	3	900	0.5
Orchards	400	4	1,600	0.9
Bushberries	400	15	6,000	3.4
Flowers/nurseries	900	2.5	2,250	1.3
Artichokes	1,300	5	6,500	3.7
Strawberry lands	**3,600**	**33**	**118,800**	**66.7**
Other crops	2,800	5	14,000	7.9
Surface Water	1,000	0	0	0
Urban, suburban, rural residential, highway, idle	7,100	0.2	1,420	0.8
Total	43,600		178,070	100

In the next section we begin examining alternative solutions to erosion in the Elkhorn Slough watershed, with particular attention to past regulatory mechanisms.

Figure 3.2 Erosion Contribution by Land Use



Source: SCS,1994,p.2,14

IV. REGULATORY APPROACHES

A. LEGISLATIVE HISTORY

The existing regulatory structure governing land use practices and nonpoint source pollution is the result of two paths of legislation that have only recently converged. Legislation addressing the needs for water quality control and for the management of coastal resources evolved essentially in parallel at both the State and federal level.

Management of coastal lands in the United States was initiated at the federal level with the enactment of the Coastal Zone Management Act of 1972 (CZMA) and subsequent amendments. This act requires coastal states to prepare coastal management plans to prioritize land uses and protect coastal resources. The CZMA also provides for the designation of National Estuarine Research Reserves (NERRs) such as Elkhorn Slough. In California, rapid coastal development prompted adoption of the California Coastal Act of 1976 to further regulate coastal development. The Coastal Act, which established the California Coastal Commission, requires local jurisdictions to prepare Local Coastal Plans (LCPs). The LCPs must be submitted to the Coastal Commission and require each jurisdiction to prioritize the use of its coastal resources.

California took the lead in water quality protection through the Porter-Cologne Water Quality Control Act, a comprehensive water resource protection statute. Porter-Cologne established the State Water Resources Control Board (State Water Board) and nine Regional Water Quality Control Boards, providing the State Water Board with broad authority to protect water quality. The regional boards each prepare a Basin Plan governing water use and water quality standards. The State Water Board and regional boards are also responsible for implementing the federal Water Pollution Control Act (Clean Water Act) in California, under the guidance of the Environmental Protection Agency (EPA). This act, adopted in 1977 and as amended, requires states to issue National Pollutant Discharge Elimination System permits to control the point source discharges of pollution to surface waters. An important addition to this legislation (section 319) requires each state to develop a Nonpoint Source Management Program

which describes the measures to be taken to address NPS. The State Water Board's Nonpoint Source Management Plan, adopted in 1988 in compliance with section 319 amendments, provides a statewide plan and recommended practices for addressing NPS pollution.

Recognizing the importance of better controlling NPS pollution for the protection of both water quality and coastal resource use, Congress passed the Coastal Zone Act Reauthorization Amendments (CZARA), including amendments to the Clean Water Act, which were signed into law on November 5, 1990. Section 6217 of this act requires that states with an approved coastal zone management program, including California, develop a coastal nonpoint source pollution control program (CNPCP) that cites specific NPS management control measures. The plan must also identify land uses which individually or cumulatively may cause or contribute significantly to the degradation of coastal waters, identify critical geographic areas adjacent to coastal waters, and implement additional measures when necessary to achieve and maintain water quality standards. To comply with the 1990 CZARA amendments, the State Water Board plans to incorporate Section 6217 requirements into their update of the statewide Nonpoint Source Management Plan, with the California Coastal Commission in an advisory role. CZARA sets a 1996 completion deadline for the adoption of state CNPCPs. A state's penalties for failure to comply with these amendments include withholding grants available through both the Coastal Zone Management Act (which go to the Coastal Commission) and the Clean Water Act (which go to the State Water Board).

B. AGENCY ROLES, RESPONSIBILITIES AND LIMITATIONS

1. Environmental Protection Agency

The Environmental Protection Agency is responsible for ensuring that states have taken appropriate measures to comply with the broad federal mandates, most recently CZARA of 1990, and for assisting states in meeting those federal mandates. With respect to compliance, the EPA will determine whether the State has taken sufficient actions to comply. As for providing assistance, CZARA Section 6217 directs the EPA to prepare a guidance document specifying

management measures[4] to assist the states in preparing their plans. Accordingly, the EPA recently released its "Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, G6217".

The guidelines for NPS management describe some the most common NPS problems and recommend best management practices (BMPs) to control NPS. Most of the practices recommended for agriculture are generalized to apply to most crops, but provide little implementation or technical detail. Some are clearly inapplicable for strawberry farming and for the types of soil erosion and land conditions found in Elkhorn Slough. For soil erosion, some ranges of effectiveness and general costs estimates are provided. While this information can be useful, it is clear that the EPA does not have sufficient information to develop specific regulations (i.e., identifying precisely what erosion control devices should be required on strawberry farms). So EPA has left the design of regulations to the states, recognizing that "the solution to nonpoint pollution lies in State and local action."[5]

2. State Water Board and Regional Water Quality Control Boards

The State and Regional Water Boards have the same information problem as the EPA (i.e., lack of detailed information of local conditions), though to a lesser degree. Another limitation encountered by the Water Board is that monitoring or enforcing NPS regulations is difficult (unlike point source pollution, where the source and quantity of pollutant is identifiable). State action, therefore, focuses on making sure that new development adheres to BMPs. The Water Board's ability to regulate land use, however, is limited to actions which require permitting.

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4 "Management measures" are defined as "economically achievable measures for the control of the addition of pollutants from existing and new categories and classes of nonpoint sources of pollution, which reflect the greatest degree of pollutant reduction achievable through the application of the best available nonpoint pollution control practices, technologies, processes siting criteria, operating methods, or other alternatives", Coastal Zone Act Reauthorization Amendments of 1990, section 6217(g)(5).

5 United States Environmental Protection Agency, "Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, G6217", p. (forward).

3. California Coastal Commission

The Coastal Commission administers both federal and State coastal policy. In its role in implementing the CZARA requirements, the Commission is working with the State Water Board to develop the policies that will comprise the coastal nonpoint source management plan. In implementing State policy, the Commission operates a system with local participation yet central control. The Commission works with local governments to incorporate the Coastal Act's policies into Local Coastal Plans, which are drafted at the local level and certified by the Regional and State Coastal Commissions. The Commission must ensure that the policies of the Coastal Act are carried through. High priority is placed upon the preservation and protection of natural resources including environmentally sensitive habitat areas such as Elkhorn Slough. However, the Coastal Act also states that the maximum amount of prime and other productive agricultural land should be kept in production in order to sustain the local economy. This State policy, combined with the importance of agriculture in the Monterey County economy, results in the inability and unwillingness of local planners and regulators to impose burdensome requirements on farmers or agricultural land owners.

In 1976, before NPS was a recognized problem, advancing agricultural interests and protecting the environment were not in conflict as they are today. As discussed in Chapter II, erosion from farmland, particularly strawberry farms, poses a major environmental threat to Elkhorn Slough. The Coastal Act, however, provides the Coastal Commission with little authority to restrict or regulate agricultural practices.

Furthermore, in cities and counties like Monterey County that have certified LCPs, land use decisions are made by the local jurisdiction. To the extent that local jurisdictions can formulate their own policies, the Coastal Commission's authority is further limited.

4. Monterey County Planning Department

While the County may not suffer from the same informational deficiencies regarding local conditions as does the State, it still faces the enforcement problems inherent in NPS and is bound

by the same Coastal Act policies protecting agriculture. Thus the North County Land Use Plan (the certified Local Coastal Plan for Elkhorn Slough and neighboring area) includes many requirements for new residential and industrial development, and requires that highly erodible steep land brought into agricultural production include erosion control measures, but cannot address the problems of existing agricultural lands through regulation. Even new land brought into production can escape permitting and the associated requirements if the land is already zoned for agricultural use.

5. Monterey County Department of Public Works

A significant portion of the soil that is washed off the land ends up, at least intermediately, on the roadways surrounding the slough (see Figure 3.1, page 8). This situation creates opportunities for the Department of Public Works (DPW) in two different roles. On one hand, DPW is part of the regulatory mechanism: the location of silt deposition provides an indicator of problem erosion spots, potentially leading to identification of a party responsible for NPS pollution (the necessary enforcement information that is difficult to come by in many instances, as discussed above). On the other hand, because DPW practices affect what happens to the silt before it ends up in the slough, DPW has the opportunity to reduce sedimentation and is thus one of the regulated parties. DPW's two roles in NPS policy implementation are described and evaluated below.

(a) Regulatory Role: Enforcement

After each heavy rain, DPW sends a workman out to survey the roadways and clear away any dirt that is obstructing the roads.[6] DPW has learned where the regular problem areas are, and confirms that these problem areas are primarily associated with strawberry farms. To address the immediate traffic hazards of the erosion, the dirt is pushed to the side of the road with

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6 Information concerning the road clearing and hauling practices of the Department of Public Works, as well as cost estimates for performing that work, was provided by Vic Louis, District 1 Road Foreman in a personal interview on April 8, 1994.

a grader. The material is hauled away if the rains were so heavy as to have resulted in huge amounts of dirt, or if repeated grading has resulted in build up of dirt on the side of the roads such that there is no more room on the road shoulder. Excessive erosion can also result in flooding and require clearing of culverts which can become blocked.

Silt runoff from private fields onto the roadway is in violation of the State Penal Code, Streets and Highways Code, and Monterey County Erosion Control Ordinance #2806.[7] Current DPW policy is to notify land owners that they will be charged for the required cleanup resulting from silt runoff from their property, then perform the first cleanup of each year without charge and bill for subsequent required clean-up work. These bills can be substantial, ranging from several hundred dollars up to $20,000 after a severe storm.

Many land owners are never billed because only one significant cleanup may be required in a light rain year. DPW usually does not bother to submit bills for minor, routine work; only if there are multiple heavy storms in one year would owners face significant bills. For example, no bills have been issued this past winter (1993 - 94) in which rainfall was fairly light. Even when bills are issued, the County is not always effective in enforcing payment. The County has little leverage to collect on DPW bills, although several large claims have been resolved through litigation.

Another important drawback with the existing policy, from a standpoint of NPS pollution, is that the erosion problem is addressed as a traffic safety, road damage and flooding problem, but not an environmental problem. The bills are not really penalties or fines that the landowner must pay because of the environmental damages caused by erosion, but rather the bills represent actual costs incurred by the County to repair damage to the County's infrastructure. Environmental damages are not the impetus for nor are they mentioned in the notification letter sent to landowners from the Department of Public Works (see Appendix A, Sample DPW Notification Letter). Thus DPW is not really enforcing NPS regulations, because NPS pollution and environmental impacts are not the basis for the bills.

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7 Monterey County Department of Public Works, road damage notification letter dated January 8, 1993.

The usefulness of the billing policy from an NPS perspective, therefore, is limited by (1) the frequency with which landowners escape paying penalties and (2) the absence of recognition of environmental damages associated with erosion.

(b) Regulation of DPW Practices

The North County Land Use Plan, the Monterey County Erosion Control Ordinance and the County Grading Ordinance are explicit about the need to reduce erosion and protect the resources of Elkhorn Slough. But the portions of these documents pertaining to Department of Public Works sediment build-up grading practices are devoid of such environmental concerns.

Not surprisingly, then, silt runoff loaded with pesticides often remains piled on the shoulder rather than hauled away, so long as the dirt does not pose a traffic hazard. Similarly, stockpiling locations for sediment that is hauled away are chosen to reduce hauling costs, not taking into account the sensitivity of adjacent areas and the need for containment of the soil.

DPW cites lack of staff time and money, in addition to the lack of an immediate safety or traffic problem, as reasons for the dirt remaining piled on the side of the road. However, dirt that is not hauled away will eventually end up in Elkhorn Slough and thus poses a significant environmental problem if not a traffic, safety or flooding problem.

C. EVALUATION OF EXISTING REGULATORY APPROACHES

In general, regulatory approaches to reducing sedimentation in Elkhorn Slough have not been effective, as each of the regulating agencies faces significant limitations in effectively implementing and enforcing regulations. The causes of NPS pollution vary significantly with land use and land type, making NPS difficult to address through a regulatory approach. Coordinating efforts or harmonizing standards is difficult if NPS pollution is being addressed in a top down approach from a state or federal agency. Federal regulation was effective in reducing point source pollution, but NPS is much more difficult to identify and impose liability. The California Coastal Act provides broad protection to agricultural land. Accordingly, government

agencies have little control over the farming practices used on those lands. Land that has come into agricultural use since 1976 is subject to local permitting requirements that were established by local governments working in cooperation with the Coastal Commission. This too has met with limited success since enforcement is difficult after the permit has been issued. The Monterey County Erosion Control Ordinance provides the only leverage that the county has over farming practices, since the county can charge landowners for erosion clean up costs. But the costs of environmental impacts, which are very hard to quantify though believed to be quite high, are not addressed by the bills for damage to roads or property. Because the problems of regulatory approaches seem difficult to overcome, with the potential exception of interactions with the Monterey County Department of Public Works, we turn our efforts to evaluate a non-regulatory solution.

V. LOCAL REALITIES AND POLICY GOALS

The discussion up to this point should make clear that erosion from strawberry farms comprises a large part of the nonpoint source pollution problem in Elkhorn Slough. It should also be clear that regulatory actions have limited ability to solve the problem of erosion from these farms. Non-regulatory solutions to the problem, which encourage the involvement of farmers in erosion reduction, will need to account for the realities facing the farmers. This section summarizes the social and economic realities of strawberry farmers and outlines the policy goals on which our recommendations will be based.

A. UNDERSTANDING STRAWBERRY GROWERS

1. Composition of the Strawberry Market

Strawberry farming is a significant part of the Elkhorn Slough watershed and a vital economic component of Monterey County. In 1984, the Soil Conservation Service (SCS) estimated that there were 2,650 acres of strawberries under production in Elkhorn and the adjoining Moro Cojo Sloughs and since that time an additional 100 acres have been brought under cultivation. The current 2,750 acres under production (not including fallow strawberry lands) represent 44 percent of Monterey County's and 12.3 percent of California's total strawberry acreage. Due to the climate, richness of the land, and the extensive use of pesticides and herbicides, North Monterey County has some of the most productive strawberry land in the country.

Strawberry sales in Monterey County were $158 million, second only to lettuce in the agricultural economy. In Elkhorn and Moro Cojo Sloughs, strawberry production generates $70 million dollars annually. The large acreage and economic importance of strawberries combined with the current use of large quantities of pesticides in their production, makes this crop a primary

focus of research on the effects of agricultural erosion in the Elkhorn and Moro Cojo watersheds.[8] Strawberry crops gross an impressive average of $15,520 per acre[9], making farmers very reluctant to do anything on their farms that takes this land out of production.

The very profitable strawberry market has encouraged more growers to enter it. Historically, Japanese and Anglo farmers began farming in the watershed first and claimed the best land. Later, Mexican immigrants claimed the remaining land largely on steep hillsides and began farming. Due to the steep slopes, credit, and other factors, Mexicans generally receive lower prices for their berries than do the Anglos and Japanese.

2. Characteristics of Growers

In order to design programs and policies that will reduce sedimentation from strawberry farms, it is first necessary to understand the current erosion control practices and examine the social and economic factors which have resulted in the existing mix of land management approaches. Accordingly, the purpose of this section is to (1) identify farm types which are most likely to contribute to water quality problems, (2) identify the erosion control practices currently in use on the different farm types, (3) identify relationships between erosion control practices and socioeconomic factors. The information contained in this section is drawn from Daniel Mountjoy's "Farming Practices Survey and Outreach Recommendations for Elkhorn Slough Water Quality Project."

There are 118 strawberry growers and 204 ranches located within the Elkhorn Slough watershed. Of these, 12 percent are Anglo, 12 percent Japanese, and 76 percent Hispanic (see Figure 5.1). Mountjoy's research indicates that important differences exist between the land and farming practices used by the three major ethnic groups. Accordingly, the statistics presented in this section are broken down by ethnicity. Table 5.1 provides descriptive statistics on ranches and farmers.

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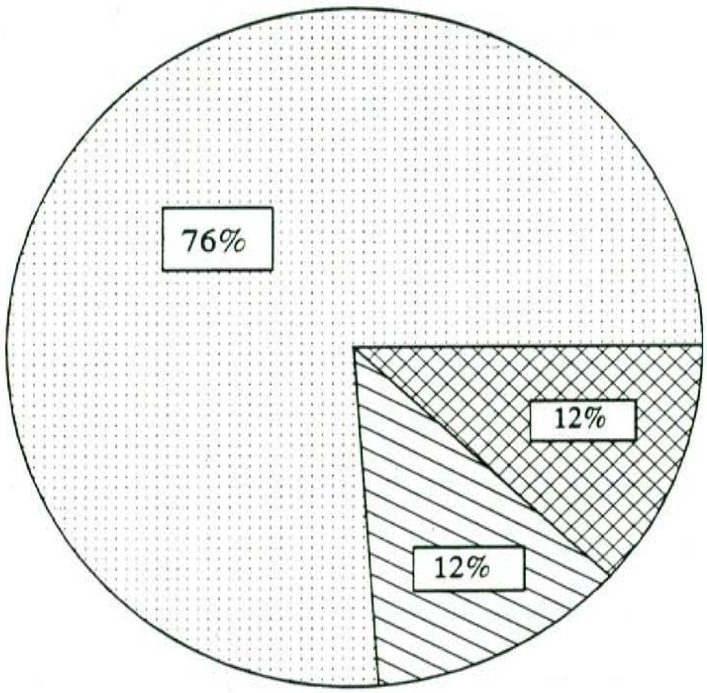
8 Mountjoy, Daniel C., under contract with the Association of Monterey Bay Area Governments. Farming Practices Survey and Outreach Recommendations for Elkhorn Slough Water Quality Project, March 1993, p. 2.

9 Mountjoy, 1993, p. 8.

Figure 5.1 Distribution of Strawberry Land According to Ethnicity and Slope



* The Anglo farms' slope is mostly in the range of 0-5%
* The Japanese farms' slope is mostly in the range of 6-15%
* The Mexican farms' slope is mostly greater than 15%

Source: Mountjoy,1993,p.6,12

Table 5.1 - Description of Farms and Susceptibility to Erosion

	Grower Ethnicity		
	Anglo	Japanese	Mexican
Average Strawberry Farm Acreage	218	34	34
Mean Gross Income Per Acre	25,011	19,914	12,161
Most Likely Slope on Ranch	Flat	Moderate	Steep
Erosion Susceptibility	Varied	Moderate	High

Table 5.1 indicates that Mexican farmers have the greatest erosion problems and lowest incomes per acre. Mountjoy also identifies the most likely erosion control practices used by each ethnic group. His analysis indicates that 44 percent of Anglos, 66 percent of Japanese, and 79 percent of Mexican growers use some type of erosion control practice. These percentages seem sensible given the fact that erosion susceptibility is lowest for Anglos and highest for Mexicans. The type of erosion control practice used differs markedly across ethnic groups. Anglos tend to use highly effective (90 percent erosion reduction) capital-intensive measures; Mexicans tend to use the least effective (50 percent erosion reduction) and least expensive measures; Japanese use measures that are between these two extremes.

Mountjoy's analysis also examined the relationship between the use of erosion control practices and various socioeconomic indicators. This produced four important findings:

1. Evidence suggests that the use of specific management practices is related to the ethnic background of growers and income levels rather than to physical conditions of the ranches on which they farm. Furthermore, ethnic groups tend to farm on lands which have different physical characteristics, yet members of the same ethnic group seem to use similar erosion control practices.

2. The use of erosion control is not related to farm size, type of soil resources, or land tenure arrangement. Instead variation in investment in erosion control results from the variations in earnings associated with the marketing system to which the berries are sold. Although this indicates that growers who earn more also invest more in production and erosion control, an economic model does not explain how growers choose between erosion control measures with the

same cost. Specifically, Mexican growers could achieve greater erosion control at a lower cost by switching from plastic lined ditches to dispersion ditches.

3. Perception of an environmental problem and attitudes about land management contribute to the type of erosion control method used. The differences in these factors is most pronounced between Japanese and Mexican growers, who both farm steep slopes. Japanese growers appear to have a strong land management ethic. They employ a number of soil conservation practices beyond erosion control. Mexican growers recognize that they have worse problems, primarily as a result of financial loss from crop washouts. Mexicans are least likely to consider the off-site effects of erosion, and some didn't consider minor runoff gullies to be a preventable erosion problem but rather a natural consequence of farming.

4. Different ethnic groups receive farming information from different sources. For example, the University Extension Service primarily serves Anglo and Japanese growers; the Soil Conservation Service has only been able to reach about 40 percent of growers; Mexican growers have attended fewer training programs than Anglos and Japanese. In addition, the personal advice networks of the three groups differs substantially. Anglos rely much more heavily on government advisors than do other groups. Japanese growers rely mostly on friends and associates for information. Mexicans are more likely to turn to other growers, family members, shippers, suppliers, or former employers for advice. No Mexican growers ever mentioned a government advisor as a source of advice.

These four factors indicate that growers' farming practices cluster along ethnic lines. The historic introduction of the three groups into strawberry farming has resulted in the development of different approaches to farming. The approaches vary by economic assets and earnings, marketing systems used, sources of information, and land management strategies. Although these clusters are not absolutely bound by ethnic lines, grower ethnicity remains one of the best predictors of farming approaches.

B. POLICY DESIGN CONSIDERATIONS

As described above, research into the farming practices of Elkhorn Slough indicates that the ideal erosion management plan depends not only on the type of land farmed but also on the ethnicity and business practices of the owners. Programs constructed to assist growers must recognize these differences and allow flexibility in their implementation to accommodate different needs of growers. A successful non-regulatory approach must address not only the physical effectiveness of erosion control measures, but also the needs, incentives and interests of individual strawberry growers. Criteria for policy design are presented below based on the specific makeup of and conditions facing strawberry growers in Elkhorn Slough. These criteria will be used to evaluate and compare the merits of alternative policy options in the following chapter.

1. Effectiveness of Erosion Control Measures

The fundamental problem that any policy needs to address is erosion into the slough. A policy that successfully reduces erosion can solve the three important social objectives of reduced sedimentation, reduced pesticide pollution, and maintained farm productivity. To effectively reduce erosion, the erosion control measures implemented must suit the conditions of the land. Farms that already have some erosion control measures in place may require a unique combination of subsequent measures to control erosion most effectively. Depending on the slope, soil and drainage patterns of the site, one measure may be more appropriate than another.

On a cumulative scale, the total amount of sedimentation reduction achieved is dependent upon the total acreage upon which measures are applied, the percent reduction achieved on that acreage, and the amount of erosion occurring on that land prior to implementation of control measures. A targeting program therefore becomes an important component of policy design: the goal is to achieve wide participation of growers on highly erodible lands, and implement appropriate measures for those farms and farmers.

2. Economic Feasibility

Ideally, a concerned agency would select projects with the highest net benefits or the highest benefit-cost ratio. The best alternative should be chosen with the minimum cost for reducing a given quantity of erosion sediment. Financial burden on farmers must be minimized. Many farmers, especially those on highly erodible land, do not own their land and therefore do not reap the long-term benefits of erosion control. Given the tight budgets of farmers and the net cost of erosion control, policies need to reduce the overall cost to farmers. Once a control practice is applied, the financial support from the government should ensure the lowest cost to the farmers.

Developing farmer access to credit for erosion control investments is another factor. This is crucial because farmers who occupy the most erodible land often have the least access to credit. The shippers and marketers of berries offer limited production credit which covers some input costs, but not labor or land improvements. Since erosion control measures selected by growers depend on access to credit, more credit would likely lead to more erosion control.

3. Communication and Education

Language differences also present an implementation barrier. Forty-five percent of the Mexican farmers do not speak English and an additional fifteen to twenty percent speak only limited English.[10] Communications between the SCS and growers have often made use of the grower's children who generally speak more English. It is clear that future implementation efforts, if they require significant interaction with farmers, will require a Spanish speaker at the ground level. Farmer education that raises awareness of the problem of non-point source pollution should be emphasized. Eighty-eight percent of the farmers on the most erodible land do not recognize that erosion creates off-site problems.[11] Furthermore, farmers may not be aware of the erosion damage reduction potential of implementing erosion control measures.

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10 Mountjoy, 1993.
11 Mountjoy, 1993, p. 27.

4. Administrative Feasibility and Flexibility

All of the interested agencies have different expertise, authority, and resources. It is important to understand why each agency is involved and the limitations of proposing changes in their activities. Policy proposals must fit in with agency objectives and draw from agency expertise and authority.

The policies must be flexible. It should be noted that much of the information about erosion control measures is sketchy and may not apply in as many instances as current knowledge would suggest. Given the risk of failure due to over-commitment to a poorly understood measure, there is a benefit to being able to switch to another technique. A good policy would leave the door open to new information and creative solutions.

Recent SCS research has identified many of the concerns addressed above. That agency is in the process of developing an approach aimed at reducing erosion by 50 percent over the next seven to ten years. Our evaluation of their approach is based on the conditions and criteria outlined in this chapter.

VI. NON-REGULATORY FRAMEWORK FOR REDUCING EROSION ON STRAWBERRY FARMS

A. NON-REGULATORY PROCESS

Apart from the regulations discussed in Chapter IV are a set of policies that we call "non-regulatory". Together, these policies affect the process whereby farmers voluntarily decide to reduce erosion and various outside organizations facilitate their desire. As discussed in Chapter V, most farmers may already use some inexpensive or easy to install erosion control measures. The emphasis here is on changes from their existing practice to more comprehensive and effective erosion control.

In this chapter we trace through the process the farmer must complete to adopt erosion control practices. We draw heavily from Figure 6.1 which depicts the stages of the process. We highlight the various barriers in the process and, in Chapter VII, propose ways of overcoming these barriers.

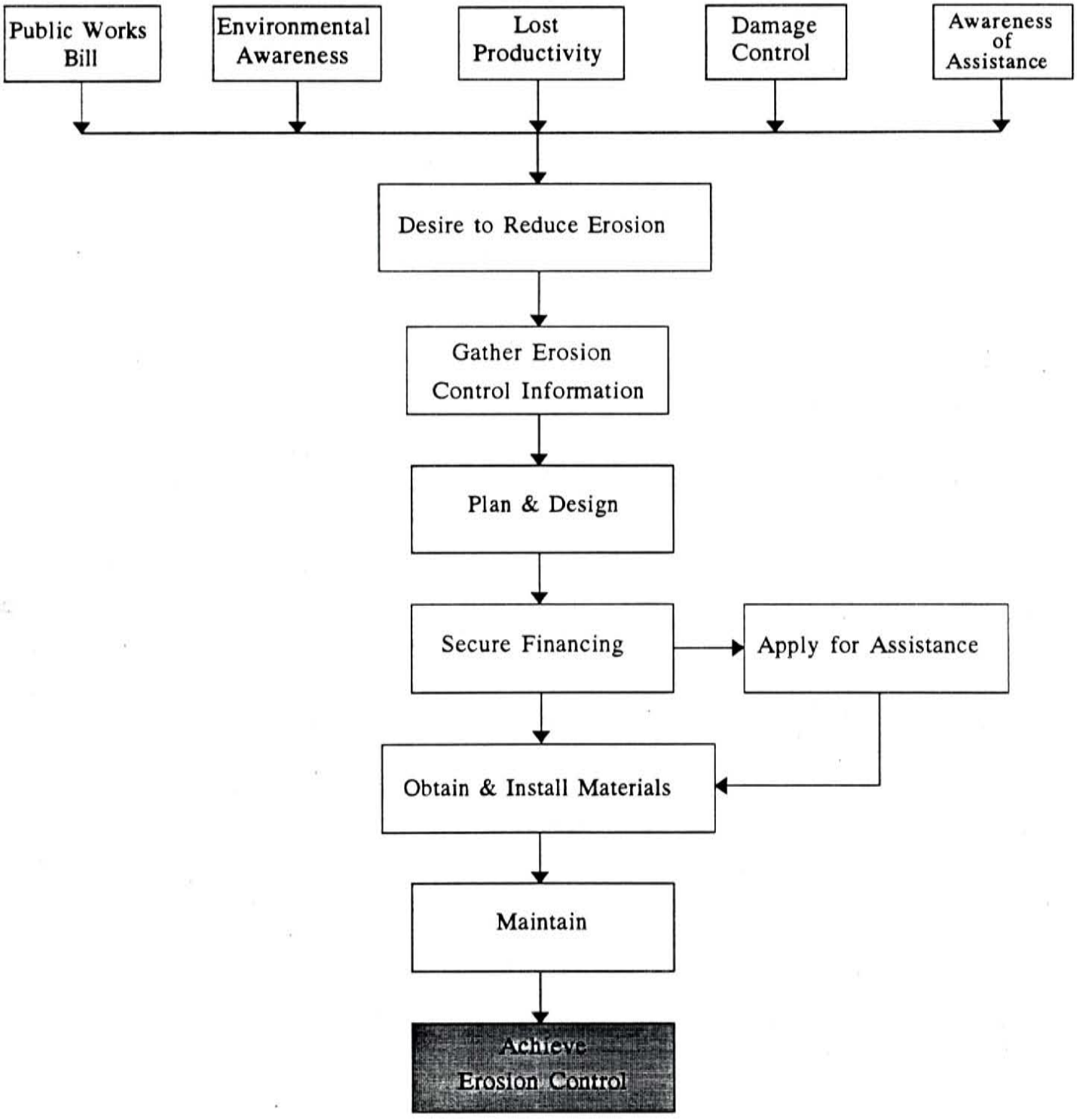
B. PROCESS DESCRIPTION

The process involved in achieving implementation of erosion control farming practices begins with motivation to reduce erosion and progresses through each practical step on the way to achieving that goal. Each step in that process is described below.

Desire to Reduce Erosion. The top row of Figure 6.1 displays the possible sources of initial motivation for farmers to improve their erosion control techniques.

- Public Works bill – The Department of Public Works, as mentioned earlier, cites farmers who let too much soil run onto roads; as part of the notification and citing process, the Department of Public Works refers farmers to the SCS for erosion control assistance. Avoidance of future bills may motivate farmers to take action.

Figure 6.1 Farming Practice Implementation Process



- Environmental awareness – Farmers, if aware of the off-site damage that results from erosion on their farm, are more motivated to reduce erosion.
- Lost productivity – Farmers in the Elkhorn Slough watershed have the same concern as farmers everywhere to maintain their soil so as to maintain the productivity level of their farms. Some farmers, however, may be unaware of or unconcerned about this longterm and sometimes subtle effect. The role of the SCS is to help farmers prevent soil loss that sacrifices their future productivity.
- Damage control – Heavy rains can cause sudden and severe erosion if soil is not well protected. Heavy rains often require expensive emergency control measures, so farmers have incentive to protect against this.
- Awareness of assistance – Farmers can be encouraged to reduce erosion if they have reason to believe they will receive assistance. The Agricultural Stabilization and Conservation Service (ASCS), a division of the U.S. Department of Agriculture (USDA), will pay for 70 percent of the cost of materials and labor to install erosion control practices.

Gather Erosion Control Information. Once the farmer has a desire to reduce erosion, the next natural step is to gather information on new methods they might use. Sources of information include:

- Soil Conservation Service. The SCS responds to requests for assistance by going out to farms and talking with farmers.
- Private consultants. Private sources of information are available and used by some strawberry farmers, but there is a charge for this service.
- Other farmers and family members. Word-of-mouth is perhaps the most widely used source of information.
- Suppliers. Farm supply stores that sell erosion control equipment advertise their products and inform farmers of effective techniques and products.

Plan and Design. When farmers have information on techniques, they need to decide which techniques are most appropriate for their farm, given the slope, existing techniques, their budget, and other technical factors. For this planning and design stage, they can draw from the SCS and private consultants. The SCS will send a representative to a farmer's land and offer planning advice and design recommendations.

Secure Financing. After deciding what erosion control techniques are most suited to their needs, they must find a source of financing. They can either:

- Pay for it themselves, in which case they move on to the purchase and install stage.
- Obtain a loan. The ASCS will pay their share (70 percent) only after farmers perform the installation and receive SCS approval. Thus the farmer may need to obtain credit for the full amount the installation, even though 70 percent will be reimbursed by the ASCS.

Obtain and Install Materials. The next step after financing is for the farmer to obtain and install the measure. Any materials are typically bought locally from a farm supply store. Farmers install the measure on their own or hire others to assist them. The SCS will provide some on-site technical assistance while growers are installing the measures. The SCS will not provide physical labor.

Maintain. The final step before future erosion is controlled is that the farmer must provide steady maintenance as needed. This can vary widely relative to the initial costs, depending on the measure chosen.

C. BARRIERS

Despite the many local, state, and federal agencies' efforts to control erosion on agricultural lands, the problem of erosion remains significant. In the previous section we outlined the non-regulatory, or voluntary, steps that a farmer must take in order to install erosion control

measures. In this section we discuss the major barriers associated with the process of implementing erosion control measures, which we depicted in Figure 6.1. The SCS has proposed a program that focuses on the "Gather Erosion Control Information" and "Plan and Design" boxes. We believe that the SCS has developed a fairly good program. However, even with the SCS program, major barriers still exist. The purpose of this section is to identify and describe these barriers.

1. Growers Do Not Have Sufficient Desire to Reduce Erosion

In Chapter IV we established that regulatory and permitting approaches to reducing sediment in Elkhorn Slough are largely ineffective. In this chapter we have created a framework for describing and analyzing the process that a grower would go through in order to voluntarily install erosion control measures. The first necessary condition in this process is that the grower must have the desire to reduce erosion. Drawing from the description of farming practices in Chapter V and the process flow chart (Figure 6.1), we identify barriers that may limit a grower's desire to reduce erosion.

(a) Benefits of Erosion Control to Grower May Not Exceed Costs

It is useful to think of the costs associated with erosion in three categories: private costs borne by growers, public costs borne by taxpayers, and environmental costs associated with degradation of Elkhorn Slough. The Soil Conservation Service has estimates for the first two cost categories; environmental damages have not yet been quantified. In this section we focus on the farmer's private benefits and costs, and in section (b) we address the public or social costs.

The SCS describes the costs of erosion damage in their "Watershed Plan for Elkhorn Slough" (1994). As one justification for their proposed erosion control plan, the SCS calculated a benefit-cost ratio of 2.7 to 1. We believe that there are two major shortcomings with the way the SCS has characterized the costs and benefits of their program. First, they grouped all benefits and costs together, ignoring distributional effects. In order for a grower to desire to reduce

erosion, the grower's personal benefits must exceed costs. Second, we believe that the SCS has drastically overestimated the private benefits that would accrue to the farmer by implementing erosion control.

In their analysis, the SCS provided costs borne by farmers and benefits that would accrue to society, excluding environmental benefits. While this may be a useful way for a government agency to evaluate a policy in the aggregate, it does not illuminate whether or not strawberry growers will be willing to participate in the SCS program. In order to gauge strawberry growers' motivations, it is necessary to examine private costs and benefits. Accordingly, we have removed the social benefits from the benefit-cost calculation.

The SCS uses a two-step process to calculate the benefits associated with their program. First, they estimate the total costs to the farmer associated with erosion damage. Then, they multiply these total costs by 66 percent to represent the expected savings associated with their program. SCS is operating under the assumption that a 50 percent reduction in erosion will produce a 66 percent reduction in damages.[12] However, we do not believe that SCS has calculated the baseline damages correctly. Table 6.1 provides a comparison of our estimates of the damages associated with erosion with SCS' estimates.

Table 6.1 - Comparison of Estimates of Erosion-Related Damage to Growers

	Crop Loss Costs	Land Loss Costs	Damage Control Costs	Total Costs
SCS Estimate	$382,000	$1,214,400	$1,469,600	$3,066,000
Our Estimate	$28,000	$0	$686,729	$714,729
Ours / SCS	7%	0%	47%	23%

[Note: See Appendix B: Comparison of Erosion Damage Estimates]

As noted above, a program of 50 percent reduction in erosion would lead to benefits of total erosion-related damages times 66 percent. Thus, SCS estimates benefits of about $2 million

12 Although we do not understand why the damage reduction is larger than the erosion reduction, we accept this assumption.

($3,066,000 * .66). In contrast, we estimate benefits of about $0.47 million ($714,729 * .66). SCS estimates that average annual costs of installing and maintaining appropriate erosion control measures will be about $0.79 million. Table 6.2 summarizes the expected costs, benefits, and the benefit cost ratio under the SCS and our scenario.

Table 6.2 - Comparison of Benefits and Costs

	Total Damages	% Reduction	$ Benefits	$ Costs	Benefit-Cost Ratio
SCS	$3,066,000	66%	$2,023,560	$790,000	**2.6**
Ours	$714,729	66%	$471,721	$790,000	**0.6**

Just as the SCS benefit-cost estimates are overly high, ours may be slightly low. This is because the SCS estimates are based on an unusually rainy winter, while our estimates are based on data from a drought year. The point that we try to illustrate with Table 6.2 is that there is good reason to believe that private costs exceed private benefits. The drought year estimates may also more accurately reflect growers' current perspectives. If this is the case, then strawberry growers will not have the desire to implement erosion control measures, purely on financial grounds.

Currently, the Agricultural Stabilization and Conservation Service (ASCS) provides assistance to landowners who wish to install erosion control measures. This money is available to tenant farmers with consent of the owner. The farmer is required to purchase and install the measures. Upon approval of the SCS, the farmers can receive a refund of 70% of the installation costs, up to a maximum of $3,500.

There are three reasons why the existing ASCS funding will not sufficiently reduce the costs to farmers. First, these funds only can be applied to installation costs. A significant portion of the total cost of erosion control measures relates to operation and maintenance costs. Second, ASCS grants can only cover 70 percent of installation costs. The grower must provide the other 30 percent. Third, ASCS will provide a maximum of $3,500 per grower. Installing

costs for many growers will greatly exceed this amount. For example, the most cost-effective combination of measures according to the SCS – grassed roads and corrugated collection pipes – costs $233 per acre, while the SCS maximum payment would be $100 on the average-sized farm. While every farm is a different size and would require different erosion control measures, it is likely that the growers will end up paying for more than 30 percent of the installation costs. This barrier is especially problematic for growers for whom erosion control would be most costly, but also most effective -- e.g., large farms on steep slopes.

(b) Growers Do Not Bear Full Costs of Damage from Erosion

The distribution of costs and benefits also creates a barrier to the implementation of erosion control measures. As discussed above, when only the effects on growers are considered, controlling for erosion may not make economic sense. However, many of the benefits of erosion control occur off-site. Specifically, sediment on roadsides produces about $200,000 in annual costs associated with traffic delays and cleanup costs. In addition, erosion imposes significant costs on Elkhorn Slough. These costs are extremely difficult to quantify. However, the U.S. government, the state government, non-profit organizations, and many individuals have indicated that Elkhorn Slough is one of the State's most precious coastal wetlands. Fishery and recreation industries dependent on the slough may also be adversely affected. Since sediment buildup represents one of the biggest threats to the slough, it is reasonable to think that the costs of erosion damage to the slough are very high.

(c) Growers Do Not Perceive Damages To Be as High as They Might Actually Be

The mere existence of high erosion damage costs is not sufficient to instill the desire to reduce erosion. Strawberry growers must also be aware of these costs. There are two reasons to believe that growers may underestimate both the private and public costs associated with erosion damage. First, some of the most erodible land has come into use in the last ten years. During this time, California has experienced a major drought. Thus, some of the growers who farm land

with the greatest potential for erosion may not be aware that erosion will be an even bigger problem if normal rainfall resumes. Second, many growers who work on much of the steep land do not consider the fact that erosion can cause off-site problems for others. Specifically, 88 percent of Mexican ranches reported no off-site damage. This problem is further evidenced by the finding that 60 percent to 70 percent of all growers reported that they would not manage erosion differently than they currently do if they had unlimited time and money. Thus, the growers on the most problematic land may underestimate both the private and social costs of erosion damage.

2. Growers Are Not Aware of More Effective Farming Practices

In Chapter V we described the information networks that farmers rely on to make decisions about which farming practices to employ. Our discussion in Chapter V indicates that many farmers do not currently have access to important information about erosion control techniques. For example, Mountjoy found the following:

- Growers who have had no contact with farm advisors are more likely to use less effective erosion control measures such as plastic ditches and surface pipes.
- 75 percent of growers have never sought or received assistance from farm advisors.
- 59 percent of Mexican growers have never attended any type of training program and are far more likely to attend one sponsored by a shipper or co-op.
- Government advisors were only named as important information sources 9 percent of the time.
- Mexicans never mentioned the government as a source of advice.
- 41 percent of all growers do not read any agricultural magazines and those they do read rarely contain strawberry specific information.

This data indicates that there is substantial opportunity to provide growers with better information about the availability and effectiveness of erosion control techniques. In particular,

Mexican farmers, who could greatly benefit from this information, currently have the least access to it. The SCS has also recognized this as a significant problem.

3. Financing: Many Growers Do Not Have Access to Sufficient Capital to Install Erosion Control Measures

Growers on the most erodible land have very limited access to credit. According to a study by Daniel Mountjoy, "variation in investment in erosion control results from variation in earnings from different marketing systems"[13], rather than other factors such as farm size, type of soil resources, or land tenure arrangement. Of the various marketing systems, lender-shippers provide the least amount of credit and lowest berry prices. They only lend a portion of the actual production input costs and nothing for land improvement. Since implementation of erosion control measures is considered a land improvement and not part of production costs, loans from lender-shippers would not be available for erosion control purposes. Mountjoy also reports that 87 percent of the Mexican farmers, who farm the steep slopes, use lender-shippers.[14] Thus, the growers for whom erosion control is most important have the least ability to make the necessary capital investment. We are unaware of any loan or credit program that can be used specifically for implementation of erosion control measures.

4. Application Process Can Be Difficult

The application process can discourage farmers from following through. The application can be complicated to fill out due to the information and documentation required. The language barrier faced by many farmers also presents a difficulty. Since 45 percent of the Mexican farmers do not speak any English and these farmers are generally on the most problematic land, this barrier can be significant.

Moreover, as described above, the total any farmer may receive is $3,500 per year. For many farmers, this is not worth the effort. To receive the ASCS funding it is also necessary that

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13 Mountjoy, 1993, p. 25.
14 Mountjoy, 1993, p. 24.

the land owner be aware of the project and be involved in the funding process. To receive funding for erosion control, an approved plan must accompany the application. These are normally provided free by SCS, and the SCS standards and methods must be used in the required plans. In many cases, however, these plans may take four months to complete due to a lack of staff time by SCS. Not only does this slow down the application process but may be discouraging enough for the grower to not pursue erosion control after he had decided to do so. Plans may be completed by consultants who use SCS methods, but these cost money which is in short supply for growers who need the erosion control most.

D. PROCESS EVALUATION SUMMARY

We have now identified the major barriers that prevent farmers from implementing erosion control measures on their farms. First, we expect that many farmers do not desire to reduce erosion because of a lack of information and the significant possibility that the costs of effective erosion reduction outweigh the benefits the farmer can expect to receive. Second, again because of lack of sufficient information, many farmers are unaware of techniques to effectively reduce erosion. Third, many farmers do not have access to credit needed to fund costly erosion control measures. Finally, the language barrier and burdensome documentation requirements may dissuade farmers from applying for available financial assistance. Using the steps a farmer must take to implement effective erosion control measures as a framework, we now explain our recommended solutions to the barriers we have identified.

VII. RECOMMENDATIONS

A. CONTEXT

Past efforts, both regulatory and non-regulatory, have been unsuccessful at reducing erosion into Elkhorn Slough. New projects are now underway. The Soil Conservation Service is seeking funding for their Elkhorn Slough Watershed Plan, which would further assist strawberry farmers in implementing erosion control measures. Notably, the plan proposes Spanish outreach efforts to overcome the language barrier in past efforts. Another potentially significant change is the recent proposal to create a Coordinated Resource Management Plan (CRMP) for Elkhorn Slough.[15] CRMPs have been used in many other watersheds around California and offer a formal means of communication and coordination among interested agencies.

This report does not address the ability of CRMPs to solve problems such as those faced in Elkhorn Slough; rather, we focus on steps that one or more agencies would have to take in order to reduce erosion. Future efforts, including those undertaken by CRMP and outlined in the upcoming Watershed Plan, will need to focus on the source of the environmental problem if they are to be successful. Our report and our recommendations are based on careful study of what can make erosion control on steeply sloped strawberry farms happen. It is our hope that groups leading the erosion control effort carefully consider the recommendations to follow.

Preceding chapters have outlined the regulatory and non-regulatory environment in the Elkhorn Slough watershed and evaluated the impacts of various efforts. After concluding that non-regulatory solutions have more potential than regulatory ones, Chapters V and VI outlined the process through which growers reduce erosion voluntarily and identified the main barriers in that process. In Chapter V we illustrated that erosion problems are largely related to the farming of steep slopes by Mexican growers. These growers have unique socio-economic charactersistics that must be considered when developing programs. In Chapter VI, we identified the steps that are necessary for farmers to implement erosion control measures. We also identified important

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15 California Coordinated Resource Management and Planning (CRMP), CRMP Handbook, 1990.

barriers associated with the implementation process. Our recommendations in this chapter will focus on these barriers with the idea that if these barriers are overcome, growers will reduce erosion on their farms, and Elkhorn Slough will be less threatened from future sedimentation and pesticide pollution.

B. PROPOSED ACTIONS TO ADDRESS IMPLEMENTATION BARRIERS

Our recommendations focus on overcoming four types of implementation barriers. In section 1, we recommend ways to increase a farmer's desire to install erosion control measures. In section 2, we address problems associated with the communication of erosion control techniques to growers. In section 3, we describe ways to increase the availibility of capital to farmers who wish to install erosion control measures. In section 4, we recommend ways in which the myriad groups that play a role in this process can better coordinate with each other.

1. Increase Desire to Install Erosion Control Measures

Currently, most strawberry growers practice some form of erosion control. However, much more can be done. The SCS has developed a program that would help strawberry growers to design, install, and partially fund more effective erosion control measures. In order for such a program to be successful, growers have to want to reduce erosion. In Chapter VI we identified three barriers that explain why strawberry growers do not have a strong incentive to reduce the erosion from their farms. These barriers are (1) only a small portion of the total social cost imposed by erosion is borne by the farmers, (2) a gap exists between the actual costs (both social and private) of erosion damage and perceived cost of erosion damage, and (3) the private costs to the farmer associated with installing erosion control measures may exceed the private benefits. The following recommendations focus on ways to reduce these barriers.

(a) Where Possible, Farmers Should Pay Social Costs Of Farming Practices

According to economic theory, the social costs associated with erosion from strawberry fields would be estimated, and farmers would be billed for the costs that erosion imposes upon society. While theoretically appealing, it would be difficult to implement such a program. It is difficult to monetize the environmental damages associated with sedimentation of Elkhorn Slough. Even if it were possible to estimate these costs, it would be hard to know whose runoff caused which problems. Furthermore, it would be politically infeasible to force farmers to pay these costs. Thus, it seems highly improbable that the full social costs of erosion will ever be calculated and assigned back to the responsible farmer.

However, it is possible to quantify at least some of the social costs associated with erosion and to assign these costs to the relevant land owners. In Chapter IV, we identified a process whereby the Department of Public Works bills landowners for cleanup costs associated with removing sediment that has flowed from strawberry farms on to public roads around Elkhorn Slough. Facing penalties could motivate farmers to address erosion problems. However, as explained in Chapter IV, the usefulness of the current billing policy from an NPS perspective is limited because landowners often escape paying penalties and the recognition of environmental damages associated with erosion is not communicated.

To improve the current policy's motivational effectiveness, land owners should be given only one free cleanup over the tenure of their ownership. Such a change would provide greater financial incentive to implement erosion control measures, which would achieve long-term erosion reduction and thus cost-saving benefits. At the same time, the County should strengthen its enforcement of payment. A legal specialist should be consulted to determine how collection leverage could be employed, possibly by attaching unpaid bills to property tax assessments.

Another revision in current policy would be to include information regarding environmental consequences of erosion and sedimentation in the notification letters sent to owners of problem land. While it would be difficult to legally impose fines based on the extent

of environmental damage, the above information would serve to educate the land owner and possibly to provide added incentive to reduce erosion.

(b) Reduce the Gap Between Perceived and Actual Erosion Damages

Farmers' perceptions of erosion's environmental effects plays an important role in erosion control process. However, in Elkhorn Slough some farmers underestimate the environmental damages associated with erosion. Some of the most erodible land has come into use in the last ten years. During this period, there has not been significant rainfall in California. Therefore, some of the growers whose land has the greatest potential for erosion may not be aware of erosion's full effects if normal rainfall resumes. Furthermore, 88 percent of Mexican growers reported no off-site damage. Findings have shown that 60 to 70 percent of all growers reported that they would not change their erosion control habits even if they had unlimited time and money. Raising growers' awareness of erosion's effect is one of the goals of erosion control.

To overcome these barriers, a well-trained erosion control staff should be established. Each staff member (who is fluent in Spanish) will work one-on-one with farmers to explain the effect of erosion from strawberry lands, describing costs to farmers and society. New erosion control practices with their benefits will be introduced to farmers, ensuring that the farmers understand erosion damages and government efforts to reduce erosion. It is essential to make growers perceive their important roles in the erosion control process. This process demands time and money; however, the predicted result would be a significant contribution to erosion control.

(c) Since Private Costs Exceed Benefits, Increase Funding Available to Farmers

As illustrated in Chapter VI, it is likely that private costs to strawberry growers exceed the benefits associated with most erosion control measures. If this is the case, then it will be necessary to provide the farmers with a subsidy that is large enough so that private benefits exceed private costs.

The ASCS is the only existing source of grants for farmers to install erosion control measures. While these grants lower the cost of erosion control measures to farmers, they may not be enough. In Chapter VI, we estimated that the private benefit-cost ratio associated with the installation of erosion control measures is about 0.6 to 1. Thus, the costs of installing erosion control measures would have to be reduced by about 40 percent, on average, in order for farmers to face a benefit-cost ratio of 1.

As discussed in the barriers section, there are three reasons why the existing ASCS funding will not sufficiently reduce the costs to farmers. First, these funds only can be applied to installation costs. Second, the grants can only cover 70 percent of installation costs. Third, ASCS will provide a maximum of only $3,500 per grower.

For these reasons, the chances of reducing erosion in Elkhorn Slough would be improved if more grant money is made available to farmers who generate the most erosion. Currently the ASCS provides money on a per farm basis, which has nothing to do with the amount of erosion produced by the farm. There is extensive data available on the amount of erosion that is generated by different parcels of land in the slough. If ASCS kept its same total budget, but allocated money based on the amount of erosion that could be prevented rather than on a per farm basis, total erosion could be further reduced.

Another option is to increase the amount of available ASCS funds. If ASCS is unable to provide these funds, then another government agency concerned with protecting Elkhorn Slough may be able to provide funds. A final option is to solicit funds from non-profit organizations that are committed to reducing sedimentation in the slough. Several non-profits have already contributed money to farming pilot projects; perhaps these same organizations would be willing to supply funds so that farming techniques developed in pilot projects could be applied on a broader scale. Without these additional or modified funding sources, it is highly unlikely that farmers will pursue erosion control as aggressively as they would otherwise.

2. Improve the Communication of Erosion Control Techniques to Growers

Once growers have the desire to reduce erosion, they must collect information about the various techniques and measures to do so. Barriers to this include (1) information for strawberry farm erosion control is lacking or presented in the wrong format and (2) growers do not view the SCS as a valuable or trusted source of information.

Various improvements can be made to communicate erosion control techniques better to growers. The most obvious is to make sure that materials and outreach efforts are conducted in Spanish as well as English to reach the 45 percent of growers who speak only Spanish. Growers prefer on-farm, in-person, one-on-one communication of technical information. Communication efforts should use this method. This is similar to the approach started by the Monterey County Resource Conservation District who recently hired a bilingual farm advisor. More erosion control resource material written at an appropriate level and in a appropriate format should be made available to growers. Many SCS erosion control plans are complex engineering documents which is fine if the SCS will provide implementation oversight. Information directed at growers, however, must be kept simple and comprehensible. This would include less technical recommendations that could be implemented directly by the grower or by less skilled agency personnel. Communication forms other than written materials may be more effective such as instructional videos.

The most effective (trusted) communication channels should be used. Mexican growers tend to rely on other Mexican growers for information. Erosion control agencies should contract with a Mexican grower(s) to promote and provide information on erosion control techniques to other Mexican growers. Part of these activities would be to help direct Mexican grower to the SCS and other government agricultural assistance agencies and to stress the value of the services they provide. Pest Control Advisors (PCA) also have frequent contact with and trust of the growers. Erosion control agencies should work with PCAs to encourage them to include erosion control with the other services they provide.

3. Increase Access to Capital

Once growers have the desire to reduce erosion and have identified appropriate sources of information to help them with their efforts, they still may lack the credit to obtain and install the measures. Current programs providing access to capital need improvement and new credit sources need to be developed. Growers must have the ability to easily borrow money if they wish to install erosion control measures.

(a) Improve Existing Application Process

The SCS in conjunction with the ASCS provide funding to growers to help them obtain and install erosion control measures. This is up to 70 percent of the cost of the measure with a ceiling of $3,500. This program has several barriers which make the application process difficult and discourage growers from applying for financial assistance and installing erosion control measures. These barriers include: (1) complicated forms that are difficult for the grower to fill out and (2) required burdensome information including an erosion control plan based on SCS designs.

The current erosion control subsidy system application process needs streamlining. Forms should be simplified and translated into Spanish. Information requirements to apply for the subsidy should be kept as simple as possible. If growers cannot provide the required information, they should be given help to collect the needed information or the requirement should be waived. Another large impediment is that applications need approved erosion control plans based on SCS designs, and that the SCS lacks staff to quickly produce these plans. Three to four month waiting periods for plans are not unusual. The SCS should focus efforts on producing less complex plans when appropriate or hiring more staff to improve the turn-around time for design of erosion control systems. The ASCS should consider providing additional private consultants who could work with growers at a subsidized cost to expedite the planning process within SCS guidelines.

(b) Increase Availability of Credit to Growers

Even if growers are able to obtain financial assistance through current subsidy programs, it may not be enough money to obtain and install the required measures for effective erosion control. An important barrier to growers who wish to install erosion control measures is that not enough total credit or sources of credit are available to them to do so.

The current ASCS subsidy program provides up to 70 percent of programs costs with a cap of $3,500. In many cases, this is not enough to cover all the installation costs even when the grower adds in his 30 percent share of the cost. For the average farm, this works out to be only $142 per acre and only covers installation costs. Some growers need credit to cover their 30 percent of the ASCS program cost-share. Furthermore, farmers must pay for the measures up-front and then get reimbursed by ASCS. The poorest farmers, who tend to farm the most erodible land, may not have the necessary capital to cover the reimbursable costs, even for a short period of time. To address this problem, current ASCS program dollars should be targeted at growers who are on the most erodible soil. An increased cost-share ratio should be targeted at these growers, or the program cap of $3,500 should be increased for these growers who need it most.

Over 85 percent of Mexican growers borrow from their lender-shippers who loan them money to cover their production costs for growing. Erosion control is considered by these lenders to be a "land improvement" and is not applicable for these loans. Additional credit sources for growers to install erosion control measures need to be developed. Non-profit organizations or other environmental groups should be solicited for available funding to help create a loan program for growers to install erosion control measures. In addition to non-profit sources, other government agencies that have a stake in Elkhorn Slough's environmental and water quality protection should be solicited to help pay for or provide loan money for the benefits they would be reaping from better erosion control. This new loan program should have

easy application requirements and especially target growers who may not have any other options for credit to install erosion control measures.

In addition to the money for installation of erosion control techniques, financing should be made available for planning assistance with new erosion control systems and for ongoing maintenance to ensure that existing systems are working most effectively. While money is not the full answer to the erosion control problem, credit is absolutely necessary to help those farmers who desire to install erosion control measures.

4. Increase Coordination of Erosion Control Efforts

Many agencies are involved in the process of assisting farmers implement erosion control measures. Each agency may participate in one or more steps in the process, and each may have different objectives. For example, the Coastal Commission (through education), the Department of Public Works (through its billing for cleanup costs), and the SCS and the ASCS (through providing information and assistance) all attempt to affect farmer's desire to implement erosion control measures. The Coastal Commission's objective is to protect the environmental resources of the slough; DPW's objective is to reduce its costs; and SCS' objective is to ensure the future productivity of the farmland.

The way that we have organized our barriers and recommendations fails to highlight the fact that agencies with the common goal of reducing sediment need to communicate with one another in order to identify the most effective way to reduce sedimentation of the slough. Significant opportunities to achieve sedimentation reduction may be bypassed by one agency because that agency is unaware of and uninvolved with the operations of other agencies addressing the same problem. Specifically, the Monterey County Department of Public Works currently faces but does not take advantage of a direct opportunity to reduce sedimentation through hauling and properly containing roadside sediment. As discussed in Chapter IV, time, cost constraints, and the lack of immediacy with respect to safety appear to be the only barriers to the dirt being hauled away.

Sedimentation would be reduced if dirt were hauled off the road and taken to a stockpiling location where it would be contained (and not simply relocated to a new location in the watershed where it would be carried with rainfall and still end up in the Slough). We estimated the cost-effectiveness of this approach in order to compare it with the farming practices that would be implemented by the grower with the assistance of the SCS, the ASCS and others. Accounting for labor costs and equipment rental, it would cost roughly $36 to haul 12 tons of silt, or $3 per ton.[16] Conservatively adding 50 percent to these costs for fuel and supervision, hauling away roadside silt would cost approximately $4.50 per ton.

If the cost-effectiveness of hauling the dirt from the roads compares favorably with other alternative measures, increasing DPW's staff and/or budget should be considered, possibly using funds allocated to reduce NPS or protect the Elkhorn Slough National Estuarine Research Reserve. To make this comparison, we compiled cost and erosion reduction effectiveness data on the most promising erosion control farming practices applicable to strawberry farms in the Elkhorn Slough watershed and calculated the cost-effectiveness of those measures in terms of cost per ton of erosion reduction. The results of this analysis are presented in Table 7.1.

As Table 7.1 shows, the cost-effectiveness of these farming erosion control techniques range from $4.90 per acre to $29.90 per acre. Thus, DPW's hauling of roadside sediment is more cost-effective than even the best erosion control measure, grassed roads and corrugated collection pipes. It would be an efficient use of resources, therefore, to involve the DPW in erosion control. We therefore recommend that additional funding for this DPW activity be provided. To ensure that DPW staff actually increases hauling of roadside dirt, their motivation to do so and any technical barriers must be considered.

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16 Vic Louis estimates labor costs at $25 per hour and truck rental at $10.70 an hour. He estimates that three truck loads of 4 cubic yards each could be hauled in one hour. Two independent landscaping materials suppliers estimated that sandy soil similar to the accumulated silt would weigh between 1,600 and 2,600 pounds, or approximately 1 ton.

Table 7.1. Cost-Effectiveness of Erosion Control Techniques[17]

Erosion Control Technique	Avg. Annual Cost ($)/Acre	Current average erosion rate (tons/acre)	Erosion Reduction		Avg. Annual Cost ($) per Ton of Reduction
			percent	tons/acre	
1	267	33	50%	16.5	16.2
2	551	33	80%	26.4	20.9
3	389	33	40%	13.2	29.5
4	406	33	70%	23.1	17.6
5	494	33	50%	16.5	29.9
6	445	33	80%	26.4	16.9
7	335	33	80%	26.4	12.7
8	**145**	**33**	**90%**	**29.7**	**4.9**
9	256	33	90%	29.7	8.6
10	571	33	90%	29.7	19.2
11	661	33	95%	31.35	21.1

Key:

1 Plastic covered roads (used)
2 Plastic covered roads (new)
3 Waterbars and plastic-lined ditch (used)
4 Waterbars and plastic-lined ditch (new)
5 Grassed roads, waterbars, and plastic lined ditch (used)
6 Grassed roads, waterbars, and plastic lined ditch (used)
7 Dispersion channels and grassed roads
8 Grassed roads and corrugated collection pipes from furrows
9 Grassed roads and underground outlets
10 Underground outlet and sediment basin
11 Underground outlet, sediment basins, grassed roads, and diversion ditch at top of field

To confront the problem of DPW's lack of immediacy in addressing environmental impacts, greater coordination is needed between the Monterey County Planning and Building Department and the Department of Public Works. The Coastal Commission, through its role as

17 Kevin Boyle, Agricultural Economist, USDA Soil Conservation Service, unpublished cost estimates, April 26, 1994.

reviewer and certifier of the County's LCPs, can facilitate this coordination. The North County LCP and other documents addressing erosion control and grading practices should be amended to recognize this important connection between DPW (and other County) actions and the protection of the slough, and to assign DPW an explicit responsibility in protecting the slough. Increasing DPW's budget and/or staff would provide the necessary incentive for DPW to comply with these recommended new responsibilities. DPW should be involved in determining the necessary budget/staff increases.

In conjunction with this approach, a program to distribute the dirt would also be needed so that stockpile areas do not exceed capacity. Currently, up to 100 cubic yards of the dirt, which presumably makes good contained fill material, is provided for free to any individual who requests it. A grading permit is needed for amounts over 100 cubic yards. Nevertheless, dirt is reportedly accumulating in the stockpile areas more rapidly than it is distributed, even at current levels of hauling. Most people in the area are probably unaware of the availability of this material. The County building or planning department could inform customers seeking building permits that this dirt is available free of charge.

Finally, if silt is hauled from the roadside and deposited in an area within the watershed where it is not confined, it is just as likely to be carried into the slough as it if it remains on the road and no sedimentation reduction has been achieved. Monterey County should require that all stockpile areas be confined and properly situated, and should work with DPW to relocate stockpiles to appropriate sites as necessary. This action should be taken even if no other policy changes to increase hauling are made.

VIII. SOURCES

A. BIBLIOGRAPHY

ABA Consultants. Elkhorn Slough Wetland Management Plan, prepared for California State Coastal Conservancy & Monterey County Planning Department, December 1989.

California Coastal Commission. Report #2: Morro Bay Pilot Project: The Second of Four Reports to Assess the Establishment of the New Coastal Nonpoint Pollution Control Program Using the Morro Bay Watershed as a Model, March 1991.

California Coastal Commission. Administrative Regulations, Barclays Official California Code of Regulations, Title 14, Division 5.5, updated May 1993.

California Coastal Commission. California Coastal Act of 1976, as of January 1994.

California Coastal Commission, Central Coast District. Monterey Bay Initiative: Synopsis of Work Plans for Water Quality Projects in Elkhorn Slough, January 1994.

California Coordinated Resource Management and Planning (CRMP), CRMP Handbook, 1990.

California Sea Grant College Program. California's Coastal Wetlands (Sea Grant Report Series #2), Spring 1979.

California, State of, Department of Fish and Game. The Natural Resources of Elkhorn Slough: Their Present & Future Use, January 1982.

California, State of, State Water Resources Control Board, Division of Water Quality, Nonpoint Source Program. Nonpoint Source Management Plan, November 1988.

California, State of, State Water Resources Control Board, Regional Water Quality Control Board, Central Coast Region, Region 3. Water Quality Control Plan, Central Coast Basin, November 1989.

California, State of, State Water Resources Control Board, and California Environmental Protection Agency. California Enclosed Bays and Estuaries Plan: Water Quality Control Plan for Enclosed Bays and Estuaries of California, adopted November 1992, effective May 1993.

California, State of, State Water Resources Control Board, and California Environmental Protection Agency. California Inland Surface Waters Plan: Water Quality Control Plan for Inland Surface Waters of California, adopted November 1992, effective May 1993.

United States Government. President Clinton's Clean Water Initiative, January 31, 1994.

Elkhorn Slough National Estuarine Research Reserve. An Overview of Research Projects at the Elkhorn Slough National Estuarine Research Reserve, July 1993.

Monterey, County of. Initial Study: North County Land Use Plan, April 1993.

Monterey, County of. Moss Landing Community Plan, Local Coastal Program, adopted February 1981.

Monterey, County of. North County Land Use Plan (Final Draft), April 1993.

Monterey, County of. North County Land Use Plan, Local Coastal Program, certified June 1982.

Monterey, County of, and San Benito, County of. Elkhorn Slough Watershed Project: Draft Watershed Plan and Environmental Assessment, sponsored by the Monterey Coast Resources Conservation District, assisted by the United States Department of Agriculture Soil Conservation Service, January 1994.

Mountjoy, Daniel C., under contract with the Association of Monterey Bay Area Governments. Farming Practices Survey and Outreach Recommendations for Elkhorn Slough Water Quality Project, March 5, 1993.

Natural Resources Defense Council and Coast Alliance. Upstream Solutions to Downstream Pollution: A Citizens' Guide to Protecting Seacoasts and the Great Lakes by Cleaning Up Polluted Runoff, December 1993.

Santa Cruz, County of, Department of Planning, Resource Section. Stream Care in Santa Cruz County: A Guide for Streamside Property Owners.

Silberstein, Mark and Eileen Campbell, Elkhorn Slough

Tuttle, Andrea Elizabeth. Cumulative Impact Asessment in Coastal Wetland Watersheds: Jacoby Creek, Humboldt County, November, 1985.

United States Congress, 92nd Session. Coastal Zone Management Act of 1972 (Public Law 92-583), (80 Stat. 203, as amended), October 1972.

United States Congress, 95th Session. Clean Water Act of 1977 (Public Law 95-217), December 1977.

United States Congress, 101st Session. Coastal Zone Act Reauthorization Amendments, Section 6217 (Public Law 101-508), November 1990.

United States Department of Agriculture, River Basin Planning Staff, Soil Conservation Service. Watershed Area Study Report and Technical Report: Strawberry Hills Target Area, Monterey County, California, June 1984.

United States Department of Agriculture, Soil Conservation Service. Draft Watershed Plan and Environmental Assessment: Elkhorn Slough Watershed Project, Monterey and San Benito Counties, California, January 1994.

United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Sanctuary Program. *Marine Sanctuary*, Vol. 1, No. 1, Spring/Summer 1993.

United States Department of Commerce, National Oceanic and Atmospheric Administration, Office of Coastal Zone Management, and State of California Department of Fish and Game, The Resources Agency. Elkhorn Slough Estuarine Sanctuary, Proposed Estuarine Sanctuary Grant Award for Elkhorn Slough, Monterey County, California: Final Environmental Impact Statement, August 1979.

United States Department of Commerce, National Oceanic and Atmospheric Administration. Monterey Bay National Marine Sanctuary: Final Environmental Impact Statement/Management Plan, June 1992.

United States Environmental Protection Agency, Office of Communications, Education, and Public Affairs. NPS Pollution: Runoff of Rain and Snowmelt – Our Biggest Water Quality Problem, *EPA Journal*, Vol. 17, No. 5, November/December 1991.

United States Environmental Protection Agency, Office of Water. Nonpoint Sources Agenda for the Future, January 1989.

United States Environmental Protection Agency, Office of Water. Proposed Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, May 1991.

United States General Accounting Office, Resources, Community, andEconomic Development Division. Water Pollution: Greater EPA Leadership Needed to Reduce Nonpoint Source Pollution, October 1990.

B. SOURCES

Kevin Boyle, Agricultural Economist
US Soil Conservation Service
Davis, CA

Al Cerna
US Soil Conservation Service
Salinas, CA

Manuel Gomez
North County Strawberry Farmer
Conservation Farmer of the Year

Mike Gonzales
US Soil Conservation Service
Salinas, CA

Jeff Jensen, Coastal Planner
Califonia Coastal Commission
Central Coast District Office

John Knight
Monterey County Planning and Building Inspection Department

Vic Louis
Road Foreman, District 1
Department of Public Works
Monterey County

Laurel Marcus
Program Director
California Coastal Conservancy

Richard Moreno
Strawberry Farmer
North County

Daniel Mountjoy
US Soil Conservation Service
Salinas, CA

Richard Smith
UC Agricultural Extension Service
San Benito

Les Strnad
Supervisor of Planning and Regulation
California Coastal Commission
Central Coast District Office

Dave Sullivan
Department of Public Works
Monterey County

file

Appendix A

Sample Notification Letter

MONTEREY COUNTY

DEPARTMENT OF PUBLIC WORKS

(408) 755-4800. 312 E. ALISAL STREET. SALINAS, CALIFORNIA 93901

GERALD J. GROMKO, Ph.D.
PUBLIC WORKS DIRECTOR

2

January 8, 1993

[redacted]

[redacted]:

SUBJECT: ROAD DAMAGE
Blackie Road, across from Rolling Meadows Lane

The Public Works Department has already begun some clean up operations in response to early winter rains. One of our major problems in the North County area is silt run-off from private fields onto the roadway. This run-off is in violation of the State Penal Code, Streets and Highways Code, and Monterey County Erosion Control Ordinance #2806.

Water and silt accumulated on the roadway from your field also puts your company at a risk of being sued, if a vehicle accident occurs related to the run-off

The purpose of this letter is twofold:

1) To ask your cooperation in preventing material from washing onto the roadway, and

2) To formally warn you that if you fail to clean up your run-off you will be charged for the required clean up, whether it is performed by County forces or private contractor

If you need assistance in regard to preventative methods and products, you can call U.S. Soil Conservation at 424-1036, or Phil Carrasco of the Monterey County Planning and Building Inspection Department at 755-5027 for information.

Sincerely,

Gerald J. Gromko, Ph.D.
Public Works Director

By Ronald Lundquist
Ronald J. Lundquist, P.E.
Deputy Public Works Director - Operations

DNS/ce

APPENDIX B

COMPARISON OF EROSION COST ESTIMATES

A major shortcoming of the SCS analysis is that they do not reasonably portray the benefits of erosion control for farmers. SCS uses a two-step process to calculate the benefits associated with their program. First, they estimate the total costs to the farmer associated with erosion damage. They then take the total costs and multiply by 66 percent to reflect the expected reduction in damage costs associated with their program. Thus, estimated damages are a function of total damages and expected reduction in these damages. In this analysis, we call into question SCS' estimate of total damages. Table B.1 provides a comparison of our estimated damage costs to those provided by SCS. The assumptions behind the respective numbers are provided as well.

Table B.1 - Comparison of Erosion Damage Estimates

	SCS Assumption	SCS Value	Our Assumption	Our Value	Our Value/ SCS Value
Crop Loss Costs	$141 per Acre/Year	$382,000	$10 per Acre/Year	$28,000	7%
Land Loss Costs	58 Acres per Year	$1,214,400	$0 per Acre/Year	$0	0%
Damage Costs	$428 per Acre/Year	$1,469,600	$200 per Acre/Year	$686,729	47%
Total		**$3,066,000**		**$714,729**	**23%**

Crop Losses

SCS Value

SCS estimated crop losses of $382,000 per year (SCS, 1994, Table 5A). We divided this total value by the number of strawberry acres in production (2700 acres) to obtain an estimate of crop losses per acre of $141.

Our Value

Mountjoy's 1993 survey reports that in the 1991-92 season, 12 Mexican and 2 Japanese farmers suffered crops losses of more than $1000.[1] Assuming the actual damage is $2000 on these 14 ranches and that the damage to the remaining 50 ranches in the watershed is $0, total crop damage is $28,000. This can be converted into a per acre figure ($10 per acre) by dividing the total damage ($28,000) by the number of acres (2700).

Land Losses

SCS Value

In the 1994 Elkhorn Slough Watershed Project report, SCS indicates that damage costs associated with land damage and restoration totaled $2,684,000. These values are based on research presented in a 1984 SCS report titled "Strawberry Hills Target Area." In the 1984 report, SCS estimated that $1,214,400 of the total land damage costs were associated with land losses (note: the remaining $1,469,600 apply to damage costs discussed below). These costs are based on the assumption that 585 acres would be removed from strawberry production over ten years as a result of erosion damage.

Our Value

Satellite photos have shown that little or no land has been removed from production during the last ten years.[2] In fact, about 100 acres have been added to strawberry production in this time period. Thus, we estimated land loss costs of $0.

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1 Mountjoy, 1993, p. 27.

2 Based on discussions with Coastal Commission staff.

Damage Costs

SCS Value

In the 1994 Elkhorn Slough Watershed Project report, SCS indicates that damage costs associated with land damage and restoration totaled $2,684,000. Of these, $1,214,400 applied to land losses. We have assumed that the remaining $1,469,600 apply to damage control expenditures. By dividing the total damage control costs by the number of acres, we estimate a per acre cost, according to SCS, of about $428 per acre per year.

Our Value

We do not have recent data on actual damage costs. However, we assume that since both the land loss and crop loss costs are well below SCS' estimate, the damage costs will be as well. We selected a value of $200 per acre