APPENDIX F: FARM MANAGEMENT PRACTICES

Practices that are being utilized or that the Natural Resources Conservation Service (NRCS) considers important for conserving agricultural resources and protecting water quality in the Carpinteria Creek Watershed are listed below. Most of the practices are linked by a reference number to the Field Office Technical Guide maintained by the NRCS; located at USDA Service Centers; at 920 East Stowell Road, Santa Maria and 3380 Somis Road, Somis, CA 93066, and on the Internet:
http://www.nrcs.usda.gov/technical/efotg

MANAGING SEDIMENT

Soil erosion and sediment deposition are primary contributors to lowered surface water quality from farmlands. In areas where there are steep slopes, erodible soils, and intense storm characteristics, sediment delivery from farmlands can be relatively high. Roads and other areas of disturbed ground where bare soils are susceptible to the erosive action of water and wind can also be major contributors of sediment to water bodies.

Grassed Waterways (NRCS #412): Field gullies formed by concentrated runoff should be planted with grass to reduce sediment delivery to the creek.

Cover Cropping (NRCS #328)
Bare soil should be covered with non-crop vegetation during the rainy season. Any ground that is going to be left fallow during the winter months, or any young orchard crop which does not provide 100% canopy coverage should have some form of ground cover. Resident weeds can be a better cover than bare soil. Cover cropping is extremely beneficial to the watershed in that it causes more water to infiltrate, less water to runoff, and any runoff that does occur to contain less sediment.

Critical Area Planting (NRCS #342)
Vegetation is placed in an area susceptible to soil erosion. Vegetative cover reduces rainfall impact, allows more water to infiltrate the soil, filters any runoff that does occur, and slows down any runoff.

Vegetative Filter Strip (NRCS #393)
A strip of vegetation is placed at the bottom of a slope and parallel to the creek. Runoff leaving the field will pass through this vegetative strip before entering the creek.

Contour Orchard and Other Fruit Area (NRCS #331)
Rows are placed on slopes and grades that minimize erosion.

Contour Buffer Strip (NRCS #332)
Strips of vegetation are placed along rows and in the middle areas between tree rows that are farmed on the contour.

Mulching (NRCS #484)
Plant residues or other materials such as chipped landscaping trimmings are applied to the field soil surface. Rainfall impact is reduced and infiltration potential increases. Avocado resistance to root rot fungi can be increased with the addition of coarse woody mulches.

Residue Management (NRCS #329)
Plant residues are managed on the field soil surface. Branches and leaves from the avocado trees are left in the field.

MANAGING NON-PAVED ROADWAYS

Manage Roads and Roadside Ditches to Minimize Erosion Potential
Non-paved roads can be one of the largest sediment sources on avocado farms. Proper placement, grading and protection in the rainy season can reduce the potential for sediment delivery from roads. A manual used for managing non-paved roads is Weaver and Hagans, 1994.

Access Road (NRCS#560): Road placement, grade, and surface conditions are assessed for proper drainage. Roads are graded to reduce erosion.

Critical Area Planting (#NRCS342)
Erosive portions of non-paved access roads are planted with non-crop vegetation in the winter.

Mulching (#484)
Erosive portions of non-paved access roads are covered with plant residues in the winter.

MANAGING IRRIGATION

Efficient irrigation management maximizes water use for crop production and minimizes water losses caused by runoff, evaporation, and deep percolation. A portion of the water applied during an irrigation benefits crop growth by providing moisture for transpiration, preventing the build up of salts in the root zone, and moderating the air temperature around the crop. The remainder of the applied water that is lost through runoff and deep percolation not only wastes water, energy, and fertilizer, but can also transport nutrients and pesticides into ground and surface water supplies. An avocado irrigation calculator is located on the internet at:
http://growers.avocado.org/growers/pages/cimiscalculator.php?sd=growers

Irrigation Water Management (NRCS #449)
Irrigations are managed to eliminate runoff and conserve irrigation water.

Irrigation of Avocados: Irrigation systems typically used in Carpinteria for avocadoes are sprinklers. Farmers are currently converting acreage from “Rain-bird” type sprinklers to micro-sprinklers. Systems consist of one micro-sprinkler per tree. Micro-sprinkler irrigation allows water to be placed directly above the plant root zone, in small amounts and causes less runoff than sprinklers.

Irrigation System Evaluation: An irrigation system, which includes a pump, pipes and a delivery system such as gated pipes, sprinklers and or drip tapes, should be evaluated for distribution uniformity. Distribution Uniformity (DU) is a measure of the lowest and highest volume of water applied to a field divided by the average amount of water applied to that field. The greater the DU that an irrigation system can achieve, the less wasted water there is and the less runoff. Such an evaluation is made with a series of flow and pressure measurements throughout the system. Cachuma RCD operates a Mobile Irrigation Lab that will perform DU evaluations in the Carpinteria Creek Watershed, upon request (805)928-9269 ext 106.

Convert to a More Efficient Irrigation System: Irrigation system is redesigned or converted to another type.

Irrigation System Maintenance: Maintenance is one of the most important irrigation practices that a farmer can perform. Checking sprinklers for clogs and pipes for worn gaskets can increase water conservation, decrease runoff and increase distribution uniformity.

Training Irrigators
Irrigators are trained in practices that promote efficient irrigation.

Monitor Soil Moisture Content: Soil or substrate moisture status is monitored using tensiometers or other sensors. Avocados are susceptible to root-rot fungi which are most destructive in wet soils. Soil moisture monitoring is extremely important in avocados.

Plant Rooting Depths are known: Avocados roots are concentrated in the top foot of soil. They are also very susceptible to root-rot fungi that thrive in wet soil conditions.

Know Irrigation Application Rate: The application rate of the irrigation system, in inches per hour or gallons per minute are known.

Keep Water Application Records:
Records are kept of the irrigation schedule and water applied, during each irrigation.

Upgrade Outdated Irrigation System: Irrigation system is properly designed, maintained, and updated or is converted to another type.

Irrigation Scheduling: Irrigation scheduling involves knowing how much water the plant needs, determining the amount of water the irrigation system is capable of applying, and basing water applications on soil, plant and weather monitoring data. Farmers in Carpinteria probe the soil to determine the moisture content before applying water. Farmers can also utilize remotely sensed weather data from the California Irrigation Management Information System (CIMIS). This weather data includes daily evapo-

transpiration (ET) and rainfall rates obtained from Santa Barbara Golf Course. A telephone "hotline" is updated with ET and rainfall information daily (805)928-9344, and additional CIMIS information is available on the internet at:
http://www.ipm.ucdavis.edu/calludt.cgi/WXDESCRIPTION?STN=STBARBRA.C

MANAGING PESTICIDES

Pesticides that move from their site of application into surface or groundwater can affect the beneficial uses of water through their potential impact on human and animal health, and on non-target organisms. Wind and water erosion of soil, or drift from pesticide applications may contribute to pesticide movement away from the target area. Pesticides may enter surface waters in irrigation return flows and tile drainage either as water-soluble residuals or adsorbed to sediments. Groundwater in agricultural areas may also be subject to pollution from pesticides when deep percolation from irrigated land carries water-soluble pesticides to the groundwater. Many practices in this section fall under NRCS Conservation Practice Standard Pest Management #595. Consult other sources such as the UC Integrated Pest Management (IPM). Pest Management Guidelines for crop-specific IPM practices and alternatives to pesticide use can be found on the internet at www.ipm.ucdavis.edu.

Pesticide Management (NRCS #595A): Pesticide and herbicide applications are made using Integrated Pest Management (IPM) techniques. Spot spraying is often used in order to reduce the amount of spray applied. Pest control decisions are based on the presence of pests and tolerable pest densities, rather than calendar schedules. State licensed Pest Control Advisors (PCA) make chemical application decisions.

Assess Pest Populations: UC IPM Pest Management Guidelines are consulted for crop specific assessment techniques. Disease resistant varieties are planted. Blocks are scouted regularly for early detection of pests and diseases. "Hot spots" and treated separately when possible. Records of pests and beneficial insects are maintained.

Adopt Cultural Practices for Pest Management: Sanitation is practiced when handling plant material and equipment. Pest-ridden and diseased plants are removed or "rouged" out. Dust from roads onto fields is reduced through mulching and wetting. Mechanical weeding such as mowing, disking and hand weeding is used whenever practical.

Adopt Biological Control Practices for Pest Management: Biological controls are used to control pest populations where possible. Populations of beneficial insects are considered when making pesticide selection.

Make Efficient Pest Control Decisions: UC IPM Pest Management Guidelines are consulted for alternatives to chemical pest control or for reduced-risk pesticide selections. Compatible pesticides, such as selective pesticides, are used when beneficial insects are present. Application decisions are based on scouting data, pest thresholds and/or risk-assessment models. Pesticides are selected for lower risk of runoff or leaching based upon site conditions, pesticide label warnings, or transport models.

(www.ipm.nrcs.usda.gov/pestmgt/winpst.html)

Handle Pesticide and Fertilizer Materials Safely: Pesticide handlers and applicators receive yearly training that includes: how to follow pesticide label instructions and environmental hazard warnings, how to calibrate and check application equipment and/or injectors and methods of environmentally safe disposal. Applicators determine the size of the areas to be treated and soil types being treated. Pesticide and fertilizer sprayers are turned off when equipment is making turns outside of rows. Pesticides and or fertilizers are not sprayed when winds could move chemicals off-target as "drift" or when rain events are forecast.

MANAGING NUTRIENTS

Nutrient sources associated with agricultural production practices include fertilizers and other amendments, biodegradation of crop residues, agricultural and landscaping trimmings applied to land. Nutrients from these sources become pollutants when they are transported offsite into nearby streams and lakes or percolate in excessive amounts to groundwater. Nitrates and phosphates in surface water bodies contribute to eutrophication. Eutrophication leads to increases in aquatic plants and algal blooms that deplete dissolved oxygen, impacting aquatic organisms. Nitrate pollution of groundwater is widespread and a serious problem statewide because of impacts to drinking water. Nitrates are water-soluble and have the potential to leach or to runoff in surface water. Phosphates attach to soil particles and have the potential to move offsite with eroding soil. In areas with high concentrations of accumulated soil phosphorus, it can also be carried off as dissolved phosphate in runoff water.

Nutrient Management (NRCS #590): Management of fertilizer application systems, including soil and plant tissue sampling, fertilizer formulation, fertilizer application methods, and monitoring nutrients in the irrigation water make up the practice of Nutrient Management. Making sure that the fertilizer being applied relates to what the plant needs and can utilize will drastically reduce over-application of fertilizers, which is wasteful and potentially polluting. Nutrient management does not directly affect sediment reduction.

Base Fertilizer Use on Crop Needs: UC Cooperative Extension has determined the amount of nutrients that avocados grown in the Carpinteria Watershed require and this information can be obtained for from the Ventura County UCCE office: http://ceventura.ucdavis.edu/Agriculture265/.

Sampling the soil before planting allows a farmer to better manage any pre-plant fertilizers. These samples are analyzed for multiple parameters and the current year fertilizer programs are based on the lab results.

Sample Plant Tissue: Tree crops store much of their nutrient reserves in the foliage. Avocado farmers sample the leaf tissue before fertilizers are applied to compare with the soil analysis report, and adjust the fertilizer application amounts further.

Measure N in irrigation water & adjust application: The water from each well is measured annually and the portion of nitrogen in the water is included in the fertilizer application budget. Irrigation water will also be analyzed for electroconductivity (EC), phosphorus (P), sodium (Na), chlorides (Cl); H, and the sodium adsorption ration (SAR).

Make Efficient Fertilizer Decisions: Fertilizer application is timed according to crop requirements. Nutrients are injected through the drip or micro-sprinkler systems. Split applications are made. Irrigations are managed to avoid nutrient loss below the root zone. Nutrient budgets that farmers in Carpinteria Creek utilize include nutrients found in the irrigation source water, nutrients found in the annual soil and tissue samples and the UCCE published crop requirement.

Reduce Nutrient Pollution from Human Waste
Septic systems are inspected and maintained regularly. Portable toilets are regularly maintained to avoid spills.

IMPROVE WATER QUALITY IN WATERWAYS

Waterways, streams, and riparian areas are sensitive to damage from agricultural, forest and other land use activities and practices. Healthy riparian areas protect farmland from erosion and flooding. They also buffer waterways from the effects of potential nutrient and pesticide runoff.

Channel Bank Vegetation (NRCS #322) Vegetative cover is established on the banks to reduce erosion and enhance habitat. Obstructions in the waterway are removed to improve water flow and prevent bank erosion.

Streambank Protection (NRCS#580) Stream banks are stabilized with vegetation and/or structural measures to reduce erosion.

Clearing and Snagging (NRCS #326) Obstructions in the waterway are removed to improve water flow and prevent bank erosion.

Underground Outlet (NRCS #620) Steep areas of the orchard are treated with drain inlets that runoff is directed to. Inlets are connected to pipe that move the runoff water to the bottom of the slope. Rock aprons are constructed at the outlet of the pipe to dissipate energy from the drainage water and prevent erosion.

Structures for Water Control (NRCS #587)
Structures to convey field drainage water into waterways are installed and maintained.

PROTECT WATERWAY CROSSINGS

Road crossings and culverts will be assessed for proper flows and channel grades.

Fish Passage (NRCS #396) Barriers that restrict or prevent fish migration are removed or retrofitted.

Channel Bank Vegetation (NRCS# 322) Vegetative cover is established along banks to reduce erosion and enhance habitat.

Restoration and Management of Declining Habitats (NRCS#643) Invasive plant species are identified, removed, and replaced with native species.

SELF-EVALUATION

An essential element of a water quality self-assessment is the tracking of land use and management activities on an agricultural operation. Self-evaluation data that farmers can provide can be important in explaining any water quality changes that may occur due to implementation of management practices. Self-evaluation techniques can help determine whether water quality changes can be attributed to implementing management practices and not to other confounding influences such as regional geology or a source upstream of the operation. Simple field measurements are often undervalued and suspected of lacking scientific validity. However, when properly designed and carefully executed, they can provide sound data. Their strength lies in the possibility of taking large numbers of measurements inexpensively and with only semi-skilled assistance to obtain results that are more pertinent to a specific site than sophisticated experiments taking place at some distant experimental station.

Record Keeping

Farmers will keep records of weather conditions such as air temperature, precipitation, and evapotranspiration. Extreme weather events such as severe storms, floods, and droughts will be documented as will destructive events such as fires and vandalism.

Photo Point Self-Evaluation

Farmers will photograph the creek channel bank that appears unstable, and the creek crossing. Photo points will be established and photographs will be taken once each year and following any significant changes to the sites.

Farmers will establish and monitor erosion pins along creek channel bank portions that appear unstable, and the banks downstream of creek projects. Farmers will walk over their farms when it rains to identify erosion concerns.