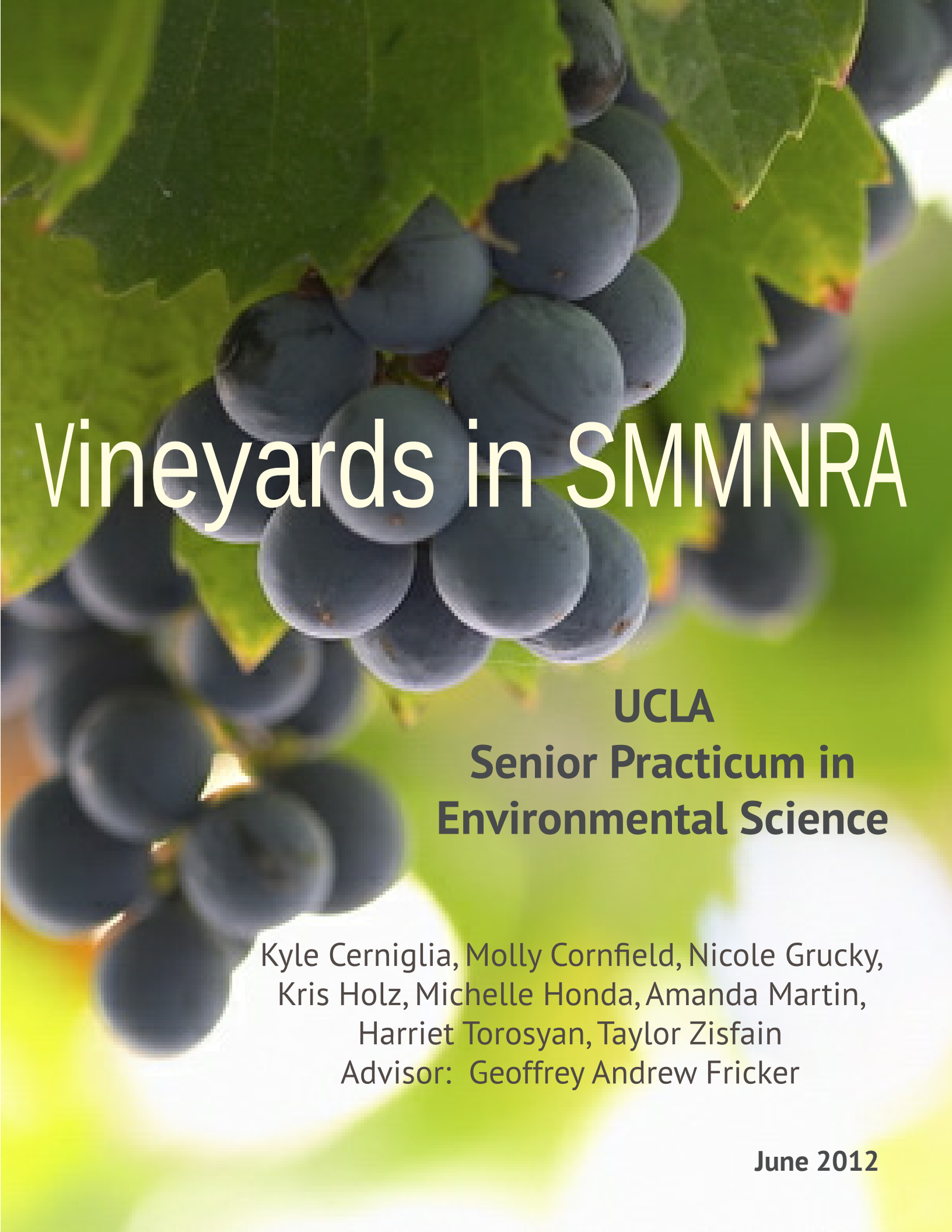

Vineyards in SMMNRA

UCLA
Senior Practicum in Environmental Science

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Executive Summary.

This document was created with the intention of addressing the issue of the expansion of viticulture in the Santa Monica Mountains National Recreation Area (SMMNRA), the impact of which is not yet well understood. Through extensive research we have identified the major aspects of the native habitat that are likely to be the most sensitive to vineyard development and have provided comprehensive information and resources to mitigate these impacts. Utilizing the most current GIS data, comprehensive maps have been generated to supplement the text and provide readers with a visual understanding of what areas are at risk for degradation.

The five main sectors assessed to be important for preserving the landscape are soils; pests and pesticides; water; affected wildlife; and policy. An analysis of each of these areas in relation to the SMMNRA is included along with recommendations for minimizing harm in each category. Techniques and practices that have been identified as sustainable for viticulture with reduced consequences on the overall environment of the SMMNRA are outlined in detail. These guidelines provide a map to a healthy, sustainable future for vineyards and the natural environment alike. It is our hope that these recommendations be taken into consideration by all involved in vineyard development in the SMMNRA.

Who we are.

This advisory document is the product of a research project conducted by the undergraduate Senior Practicum Program of the Institute of the Environment and Sustainability (IoES) at the University of California-Los Angeles. The IoES is a multidisciplinary center at UCLA that promotes sustainability at the local, regional and global scales through education, research, and advising. The Institute aims to provide solutions to environmental problems and focuses on educating future generations of scientific leaders invested in the health of the environment.

Investigation into sustainable solutions is a focus of many academic programs at UCLA including the Senior Practicum. Graduating students participate in a group research project meant to expose them to real-life sustainability problems. Each group is paired with a client agency or institution with a research question.

This project was completed by a team of eight Practicum students who spent nine months researching and working with support from clients including the National Park Service, the Resource Conservation District of the Santa Monica Mountains, and the National Resource Conservation Service. The underlying question behind this advisory document is, “what are the best management practices for vineyards in the Santa Monica Mountains National Recreation Area?”

Image 1: Our Senior Practicum group. From left to right: Nicole Grucky, Harriet Torosyan, Molly Cornfield, Michelle Honda, Kris Holz, Amanda Martin, Kyle Cerniglia, Taylor Zisfain.
Photo courtesy of Donna Martin.

What this is.

This document is intended to advise vineyard owners, both current and future, on the available options for sustainable vineyard management. We provide viticulturists with insight about the impact of their vineyards in the context of the larger natural habitat, as well as solutions to mitigate those impacts. Our goal is to provide a user friendly guide that will make sustainable viticulture simple and accessible by offering visual, textual, and spatial information catered toward the conditions within the SMMNRA. Our handbook also includes external links to resources published by governing entities and non-regulatory agencies, which will hopefully help vintners focus on relevant information for their property, thereby allowing them to create a custom plan for their vineyard.

These recommendations were developed specifically for vineyards in the Santa Monica Mountains, taking into account the unique habitat and wildlife in the area. In assessing the current practices, this advisory document has been catered to address issues that have been overlooked by some of the existing landholders. The information provided has been divided into five chapters, each of which is based on a different aspect of the relationship between vineyards and the natural environment.

Soil - Because soil is the foundation for the vineyard, it is essential that vintners understand how to maintain it. This chapter describes practices that protect soil and methods for monitoring soil health.

Pesticides and Chemicals - For the chapter on pesticides, we looked into the common pests and management techniques. This section includes charts which highlight important pests, listing the damage each inflicts and ways to identify each. We also looked into the most common infestation problems vineyards encounter and suggest feasible and sustainable methods with which to address them.

Water - Understanding watersheds and local water resources is necessary to run a thriving vineyard, so it would make sense that vineyards be managed in ways that protect this resource. Specific practices that prevent the degradation of watersheds in the region are highlighted in this section.

Affected Wildlife and Landscape - We thought it important that vineyard owners are aware of federally endangered organisms in the area. As a result, we compiled lists of species based on their level of threat. Our guide also incorporates information about how vineyards affect wildlife at the landscape scale. Thus, maps of the region are available to provide information about sensitive habitat areas.

Policies - Combing through all the policy and legal restrictions pertaining to land use and county codes can be a daunting task. The concluding section divides the information and rules governing aspects of agricultural land use in the region into different categories. We've also provided links to the published documents.

Background.

Our study focuses on the Santa Monica Mountains National Recreation Area (SMMNRA), a protected wilderness region of Los Angeles County which lays directly adjacent to both suburban and agricultural developments, and proximate to the urban center of Santa Monica. SMMNRA was chosen as the region of interest for this report for several reasons. First, Southern California is one of five Mediterranean ecosystems in the world. A Mediterranean climate is characterized by hot dry summers and cool rainy winters (Dale, 1986). Second, the SMMNRA is the largest urban national park in the United States (National Parks Conservation Association, n.d.). This large contiguous area of relatively undisturbed native habitat is a region of importance to conservationists, but also an attractive place to live. The SMMNRA accommodates a variety of land uses including various parks, beaches, and protected areas in addition to cities and developed private and commercial lands (CCCARTO, n.d.). The mixed land use creates a distinct and unique impact on the pre-existing natural environment (Syphard, Clark, & Franklin, 2005).

The introduction and addition of vineyards in the area has expanded the use of agriculturally designated zones within the SMMNRA. Until recently, the agricultural zones have been left largely unchanged from their natural state. As of 2012, the extent of land cover by vineyards has been small, many existing vineyards in the SMMNRA are less than one acre in area. Despite their small size, vineyard expansion has been rapidly rising within the past few years.

Due to the large potential for land use conversions into vineyards, it is important to understand the impact vineyards have and what measures can be made to mitigate the negative impacts on the surrounding environment. We feel it is important to be familiar with different habitats of the SMMNRA and species that live there. Maps 3-7 show the approximate distribution of the vegetation types in the SMMNRA. Observing the location of your vineyard is with respect to potentially sensitive plant or animal species is helpful for making decisions about how to structure and manage the vineyard.

There are five major vegetation regimes in the SMMNRA, each provides habitat for a variety of species (Cold Creek Docent's Program, n.d.). The following information is a description of each habitat type, with a list of a few common species belonging to each group.

Chaparral
Consists of evergreen species characterized by hard leaves, deep roots, and little to no understory. Plants are generally between 2 and 4 meters tall. Chaparral species are fire adapted, in that they can grow from seeds or stumps following disturbance by a fire. Common species in the SMMNRA include Chamise (*Adenostoma fasciculatum*), Ceanothus (*Ceanothus spp.*), Scrub Oak (*Quercus berberidifolia*), and Manzanita (*Arctostaphylos spp*.) (Cold Creek Docent's Program, n.d.).

Coastal Sage Scrub
Typically occurs at lower elevations and on drier substrates than chaparral communities. These shrubs have soft leaves, are often aromatic, and are less than 2 meters in height. Coastal Sage Scrub species generally deal with the summer drought by going dormant and even dropping their leaves, Common species in the SMMNRA are California Sage Scrub (*Artemisia californica*), White, Black, and Purple Sage (*Salvia spp.*), and Prickly Pear (*Opuntia litoralis*) (Cold Creek Docent's Program, n.d.).

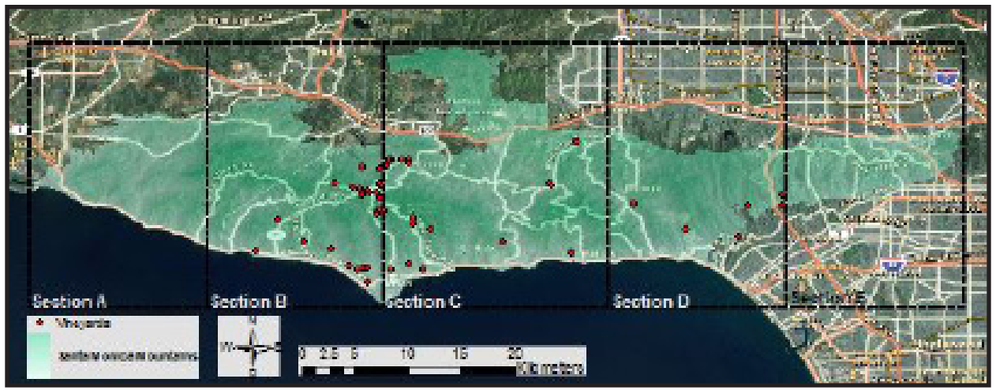
Oak Woodland
Woody species greater than 5 meters tall, best developed on north-facing slopes and in shady ravines due to the favorable microclimates in these areas. Species include: Coast Live Oak (*Quercus agrifolia*), Valley Oak (*Quercus lobata*), California Black Walnut (*Juglans californica*), and Toyon (*Heteromeles arbutifolia*).

Riparian Woodland
Located were streams flow through the bottoms of canyons and valleys. Riparian species that tolerate flooding in the winter include Poplars (*Poplus fremontii and P. trichocarpa*), Willows (*Salix ssp.*), Alders (*Aldus rhombifolia*), and Mule Fat (*Baccharis salicifolius*). Species that remain above the high water level include Sycamore (*Platanus racemosa*), California Bay (*Umbellularia californica*), Big-leaf Maple (*Acer macrophyllum*), Poplars (*Poplus fremontii* and *P. trichocarpa*), and Willows (*Salix ssp.*) (Cold Creek Docent's Program, n.d.).

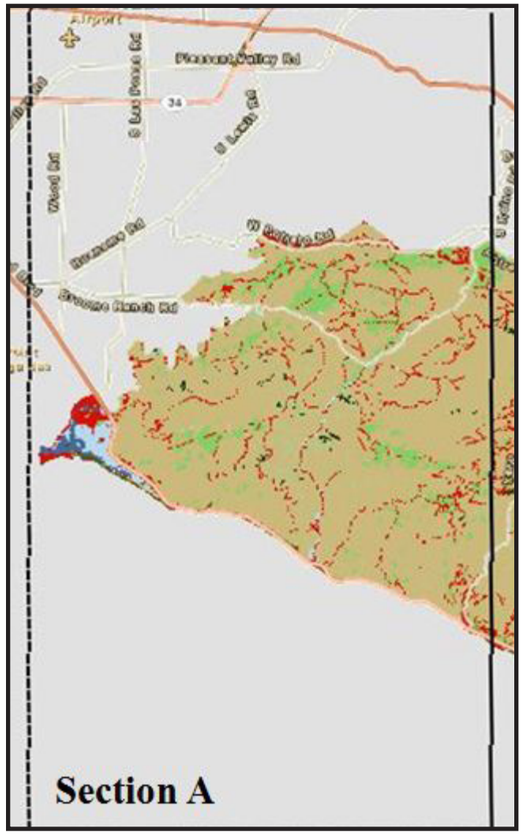
Valley Grassland
Occurs on steep slopes or flats, often co-occurring with oaks. Of the five habitat regimes, grassland is the driest, as well as the most altered by grazing and other anthropogenic effects. Common grasses include the non-native Black Mustard (*Brassica nigra*), Blue Dicks (*Dichelostema pulchellum*), Tarweed (*Hemizonia fasciculata*), Baby Blue-eyes (*Nemophila menziesii*), Mariposa Lily (*Calochortus catalinaea*), Lupines (*Lupinus ssp.*), and Owl's Clover (*Orthocarpus purpurascens*) (Cold Creek Docent's Program, n.d.).

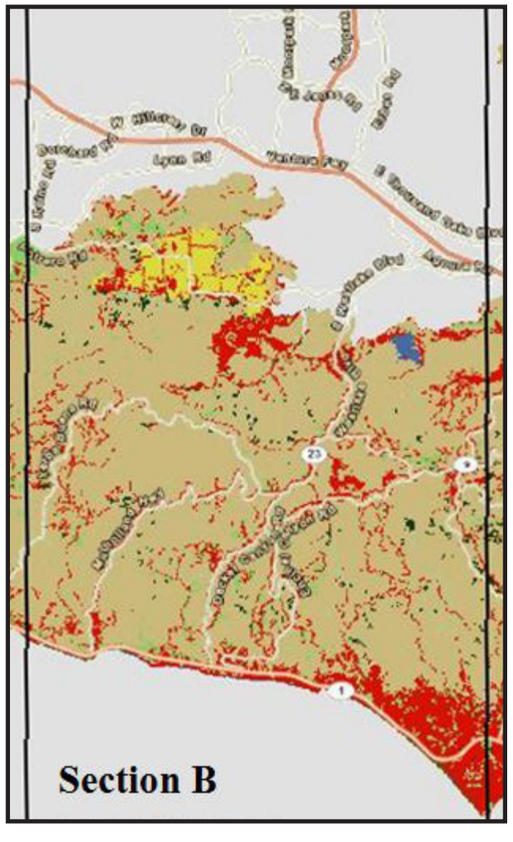
Fauna
Coastal Sage Scrub and Chaparral provide habitat for similar animals, including lizards, snakes, small rodents, small birds like wrentits, towhees, and sparrows, as well as larger carnivores like bobcats and mountain lions (National Park Service, 2005). Woodland creatures consist of many birds, including owls and hawks. Woodpeckers use the larger trees, and other animals in this habitat include the Western Pond Turtle and Mule Deer, among others (National Park Service, 2005). Grassland is home to mostly creatures that live on the ground, such as lizards, jackrabbits, squirrels, blackbirds and cowbirds. Red-tailed hawks and Golden eagles use grassland as a foraging ground (National Park Service, 2005).

Map 1: This reference map shows the proximity of the Santa Monica Mountains National Recreation Area to Los Angeles. The Santa Monica Mountains are shown in the red box.



Map 2: The Santa Monica Mountains National Recreation Area is displayed here in green based off satellite imagery from the NASA SRTM satellite. The region is broken up into five sections here that will be referenced throughout the document. The sections are labeled A through E.

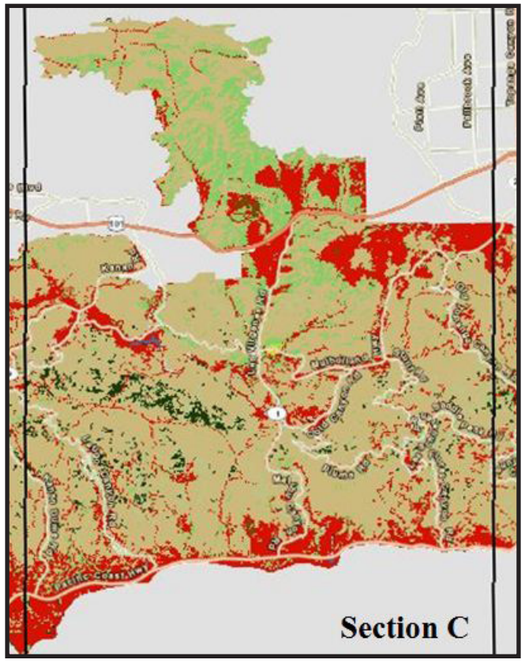


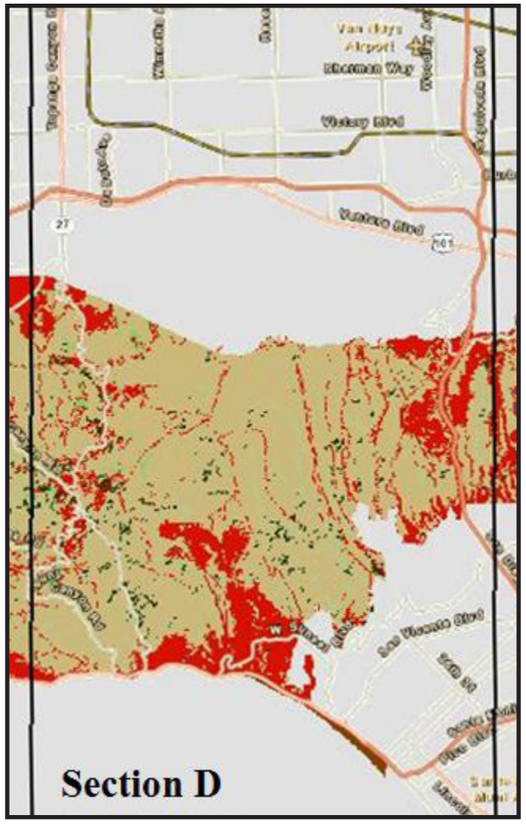


Legend 1: This legend shows the land cover classifications for the Santa Monica Mountains. The classifications are valid for maps 3-7

Map 3 (above) **Map 4** (left): The maps shown above and to the left depict land cover classifications for Sections A and B. They are primarily comprised of chaparral and coastal sage scrub.

Here, and throughout our document, we've inserted maps that we generated with the help of available data. Maps show the SMMNRA area broken up into 5 sections, for the sake of scale. These up-close aerial depictions will allow vintners to take a more focused look at their own land. It should be noted that many sections of our advisory lack a map of Section A, because data for Ventura County was unavailable.





Map 5 (top left) **Map 6** (top right) **Map 7** (bottom): The maps displayed above and to the left represent land cover classifications for Sections C-E. They display more significant sections of developed land than Sections A and B.

Soil.

The roots of grapevines make up one third of the entire plant, making soil fundamental to the health of your grapes. Obtaining an optimal environment for roots—which are essential for supplying your grapevine with water, nutrients, and air—makes soil maintenance a top priority of your management plan. The physical structure of your soils as well as biological activity and nutrient content, both naturally occurring and cultivator augmented, are all aspects which must be considered when maintaining soil health. The Code of Sustainable Winegrowing workbook offers great information, which is summarized in the following soil section.

Soil structure depends largely on two aspects: the size of aggregates and the size of the spaces between them. Spaces between large aggregates permit rapid drainage and easy root growth while the spaces between small aggregates trap water and nutrients for slow release. A balanced ratio of different sized aggregates performs best. Most naturally occurring soils retain this mixed composition. It is only with outside interference (see list below) that this composition is damaged.

Biological activity also has large consequences for soil structure and content. Microbes in the soil, which are a byproduct of the decomposition of organic matter, produce a "cement" that facilitates the formation of stable aggregates. As of yet, no artificial process has been able to mimic this slow soil formation process. In addition, macroarthropods, such as centipedes and millipedes are also involved in beneficial processes like mixing soil (Sharley et al., 2008), aeration and decomposition (Rana et al., 2012).

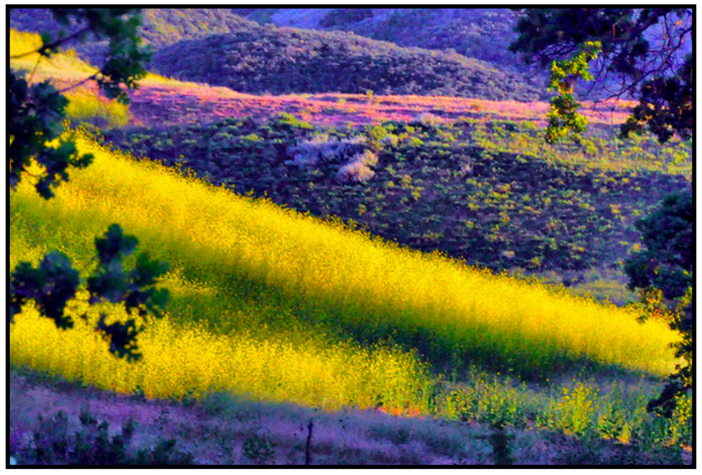


Image 2: A view of Yellow Hillside Meadow in SMMNRA. Found at http://photosbygoldman.smugmug.com/http://photosbygoldman.smugmug.com/Landscapes/california-landscapes/16628397_XSnDmm/1258418872_vjhPmdG#!i=1258418872&k=vjhPmdG&lb=1&s=M

Problems

A healthy soil structure can be damaged or destroyed rapidly by a variety of practices. Practices that can damage soil structure include:

Improper or Excessive Tillage

The negative aspects of tillage involve the disruption of surface soils which can increase soil's susceptibility to physical and chemical weathering and alter naturally occurring stratification (Franzluebbers, 2002).

Compaction

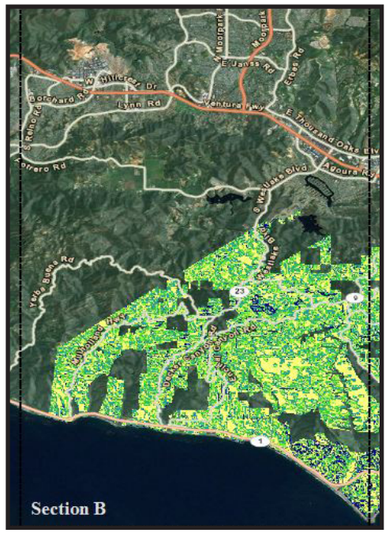
Compaction reduces the space between soil aggregates reducing drainage and making it more difficult for roots to penetrate and expand.

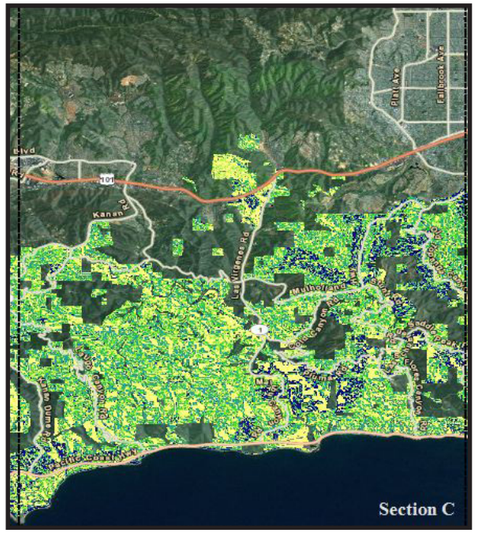
Lack of Organic Matter

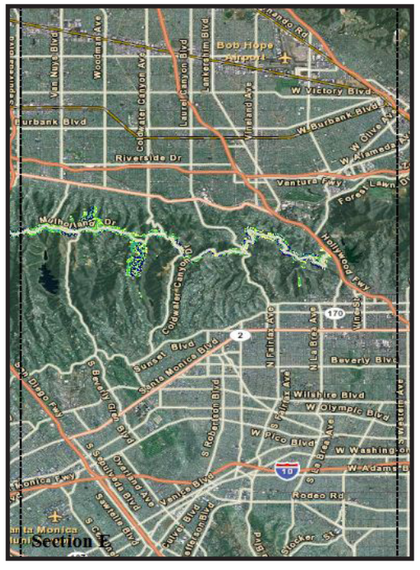
The presence of organic matter hosts numerous benefits for soil quality. Without this component important functions will be lost.

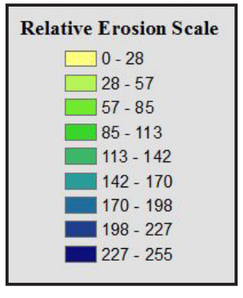
Organic matter attracts and holds nutrient in an available state, reducing leaching losses as well as absorbing and holding water, increasing its availability to plants. It also contributes to the binding of soil particles into aggregates, producing a granular structure that promotes the penetration of air to roots, the capillary movement of water, and the penetration of roots through the soil. Organic matter can also be transformed into vitamins, hormones, and other substances, which stimulate plant growth and feeds soil organisms, which, in turn, feed soil predators that prey on root pests. Without these benefits, vine growth will be negatively affected.

All of the above conditions or practices degrade the quality of the soil, which deprives the roots of water, nutrients, and air that they need to survive. Vines that grow in soils with good structure tend to be more resistant to pests, disease and other stresses.









Map 8 (top left) **Map 9** (top right) **Map 10** (bottom left) **Map 11** (bottom right): The above maps display soil loss potential for the SMMNRA. The areas displayed here include significant watersheds in addition to areas zoned to allow agriculture. Soil loss was calculated based on the Revised Universal Soil Loss Equation, which takes into account slope length and grade, soil type erosion potential, rain fall, vegetative cover, and management practices. Each section is displayed independently to show maximum detail and to help users of this document to specifically identify their location. Soil loss is represented on a relative scale from 0-255 with 255 correlating to severe soil loss potential and 0 meaning there is no soil loss potential.

Legend 2: shows the relative scale for soil loss potential and corresponds to maps 8-14.

Solutions

Detrimental practices can be mitigated using effective alternatives. Cover cropping provides the simplest and most cost-effective means of protecting and improving your soil structure. In warmer regions of California including the Santa Monica Mountains, it is almost impossible to increase the percentage of organic matter in the soil due to year-round soil biological activity, but the rate of organic matter turnover can be increased, which is perhaps even more important.

Another efficient way to keep soils healthy is to sample and test seasonally. Regular soil testing enables you to create custom fertilizer and maintenance regiments, reducing over-application and losses to runoff. It is important to maintain appropriate levels of nutrients in the soil. Listed below are recommended values of the most important nutrients (Dlott, 2002).

Table 1a.

Nutrient	***Defiency Levels***	***Reccommended Values***	***Excess Levels***
Nitrate-nitrogen (NO3)	<350 ppm	>500ppm	>2000ppm
Total Nitrogen	<1%	1.0-1.6%	>1.6%
Phosphorous	<0.1%	0.15%	
Potassium	<1.0%	>1.5%	
Calcium		>0.5%	
Zinc	<15ppm	>26ppm	
Boron	<25ppm	>30ppm	>100-150ppm

Other important soil factors include pH, salinity, and other chemical properties (Dlott, 2002):

Soil pH - Slightly acidic soils ranging from pH 6.0-7.0 are optimal for grape vines.

Electroconductivity - In general, electroconductivity measures a material's ability to conduct an electric current, but for our purposes here, it refers to a measure of soil salinity. Values under 0.7 mmho/cm are potentially problematic and over 2.0 mmho/cm will result in major yield reduction

Chlorides - under 300ppm is good, 300-700ppm is acceptable, over 700ppm is problematic

Cation Exchange Capacity - measure of the electrical charge of the soil

Base saturation - This parameter measures the ratio of cations in the soil. Important cations to monitor are sodium which should be below 5% but ideally below 2%, Potassium which should be 2-7% for good availability, Magnesium with ideal levels between 10-15%, Calcium with levels between 65-75%, and Hydrogen with less than 5%.

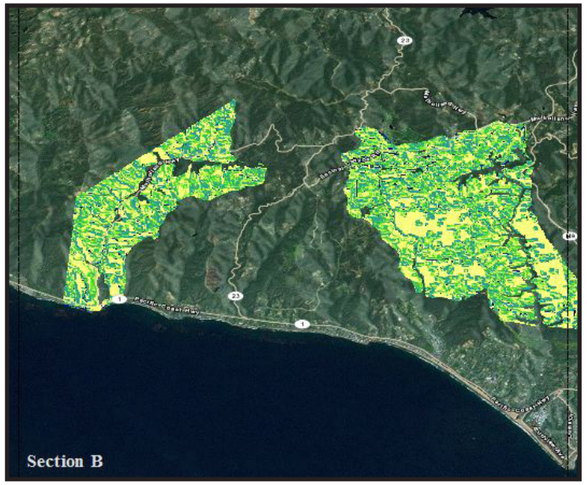
Image 3: A photo of Moraga Vineyards in the Santa Monica Mountains from lifecrowd.com found at: http://www.lifecrowd.com/blog/wp-content/uploads/2011/10/winery1.jpg

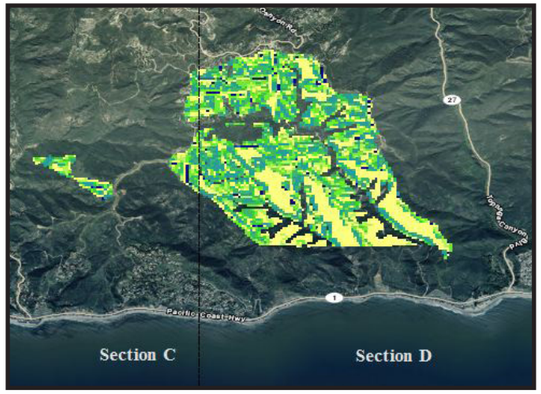
Depending on the variance of your soils from the ideal soil profiles recommended above, specific fertilizers can be used to contribute the nutrients which your soils lack. In doing so, unnecessary applications can be avoided.

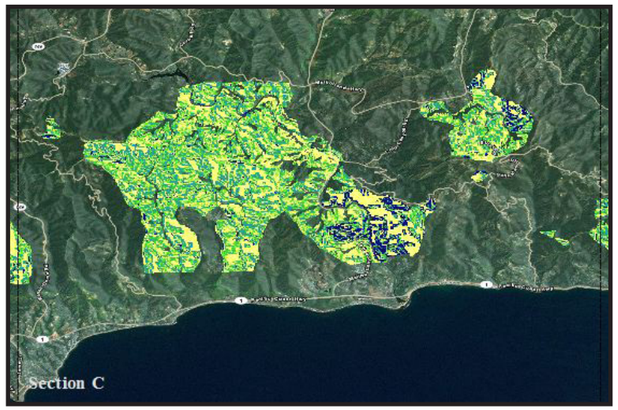
Fetilizer Types & Nutrient Content

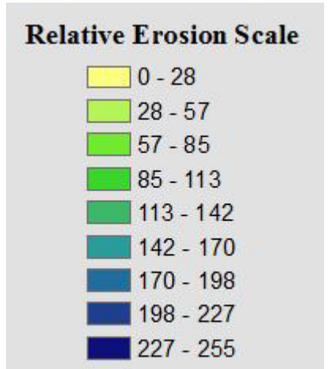
Table 1b.

Type	*Carbon*	*Nitrogen*	*Phosphorus*	*Potassium*	*Additional Data*
Green waste compost	High	Low	Some	Some	Good choice for building stable organic matter
Dairy Manure Compost	Low	High			Slow-release nitrogen
Steer manure compost	Low	High			May contain high levels of salts
Grape pomace compost		High		High	Slow-release nitrogen
Chicken manure compost		High	Very high		Slow-release nitrogen
Dairy manure		Moderate			May have lots of weed seeds
Steer manure		Moderate			Slow-release nitrogen, May have lots of weed seeds
Chicken manure		Very high		Very high	Can burn young vines if fresh, strong odor, bedding material can tie up zinc









Map 12 (top left) **Map 13** (top right) **Map 14** (bottom): The above maps display the soil loss potential for significant watersheds identified in the Santa Monica Mountains. They are evaluated based on a relative scale from 0-255 with 255 correlating to severe soil loss potential and 0 meaning there is no soil loss potential. The scale is also relative to maps 3-6. Sections are shown at the bottom to show the physical location of each watershed.

Pests & Pesticides.

Managing pests in your vineyard is imperative to producing viable crop. The use of pesticides should be managed carefully, with a primary focus on growing healthy grapes and maintaining sound environmental surroundings in the long run. One method, known as the Integrated Pest Management (IPM) plan, has proven particularly effective at accomplishing these goals. By reducing the total amount of pesticides applied overall and integrating reduced-risk pesticides and biological controls to manage pests, IPM allows healthy vineyards and surrounding environments to thrive.

Pest Management

IPM (Integrated Pest Management): Sustainable approach to managing pests by combining biological and chemical tools in a way that minimizes economic, health, and environmental risks (Dlott, 2002).

To see a self-assessment guide, refer to The Code of Sustainable Winegrowing Workbook (Second Edition).

Identifying the Pest

Grape Leafhopper-Leafhopper Feeding (stippling)

The grape leafhopper (Fig. 1) is mostly found in Northern California, but is a problem in warmer areas as well. The grape leafhopper overwinters as adults and is found on basal grape leaves and weeds during spring. It causes stippling, a spotted, silver pattern on the leaf (Fig. 2). The adult grape leafhopper is about 3mm long and light to pale yellow with distinct dark brown and reddish markings. Its natural predator is the Anagrus Wasp (Fig. 3) (UCANR, 2000a).


Figure 1

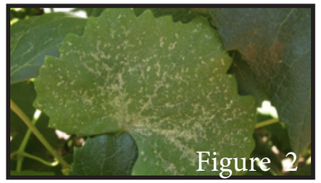


Figure 2


Figure 3

Variegated Leafhopper-Leafhopper Feeding (stippling)


Figure 4

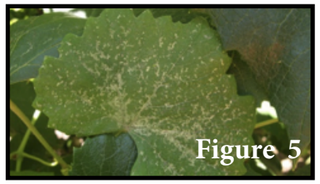


Figure 5

The variegated leafhopper (Fig. 4) is mostly found in Southern California. It has the ability to induce stippling, a spotted, silver pattern on the leaf (Fig. 5). The variegated leafhopper is recognizable by its darker coloring and distinctly mottled brown, green and white with a reddish tinge about 1mm long (UCANR, 2000a).

Willamette Mite-Yellowing


Figure 6


Figure 7


Figure 8

The Willamette spider mite (Fig. 6) is considered an early-season mite, which prefers the cooler parts of the plant and are mostly found in the shady parts of the vine. They are recognizable by their pale yellow color. They cause yellowing to the leaves (Fig. 7), when the mite sucks out nutrients. Its natural predator is the Western Predatory Mite (Fig. 8) (UCANR, 2000b).

Pacific Mite-Webbing & Bronzing

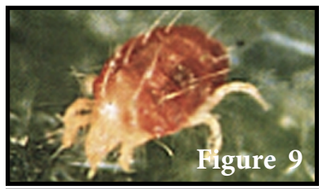


Figure 9


Figure 10


Figure 11

The Pacific spider mite (Fig. 9) prefersa the warmer upper canopy of the vine and tend to cause damage in the hotter, dryer part of the season. They are recognizable by their slightly amber to greenish coloring and can turn orange to reddish if there are high population densities. These mites construct webs, forming webbing (Fig. 10) and induce bronzing (Fig. 11), which deforms leaf tissue (UCANR, 2000b).


Figure 12


Figure 13


Figure 14


Figure 15

Omnivorous Leafroller-Bunch rot

The adult omnivorous leafroller (Fig. 12) is bell-shaped with blackish gray snoutlike mouthparts that protrude forward from the head. Their forewings are dark rusty brown with the tip being tan in color. The leafroller causes bunch rot (Fig. 13 and 14), a fruit-rotting disease. Its natural predator is the Spider Grape Leafhopper (Fig. 15) (UCANR, 2000c).

Thrips-Leaf Distortion


Figure 16


Figure 17

Thrips (Fig. 16) peak season coincides with peak vine growth, and as the vine growth slows the number of thrips decrease. They are small (0.04 inch long) with distinctive feathery wings and vary in color from yellow to brown. Thrips cause leaf distortion (Fig. 17), by destroying the plant's cells (UCANR, 2000d).

Common Vineyard Diseases

Powdery Mildew


Figure 18


Figure 19

Powdery mildew (Fig. 18 and 19) appears as white, powdery spots on the surface of leaves. The spots can spread and eventually turn leaves yellow. The leaves will then die and fall off, exposing grapes to further damage by the sun (UCANR, 2000e).

Botrytis

Botrytis (Fig. 20 and 21) is a fungus that infects berries, causing them to split and leak. This allows the pathogen to further grow and spread across the vineyard (UCANR, 2000f).


Figure 20


Figure 21

Sour Rot

Sour rot (Fig. 23) is a fungus that infects berries by entering through cracks and wounds, causing the grapes to become unhealthily soft and leak. This attracts fruit flies, who then spread sour rot further (UCANR, 2000h).


Figure 23

Phomopsis Cane and Leaf Spot:

Phomopsis cane and leaf spot (Fig. 22) appears as tiny dark spots with yellowish margins on leaf blades and veins, usually on the basal portions of the shoot (UCANR, 2000g).

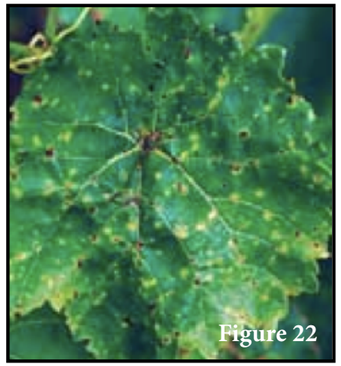


Figure 22

Eutypa Dieback

Eutypa dieback (Fig. 24) is a fungus that creates darkened cankers within the vascular tissue. Eutypa dieback is not generally visible in vines younger than five years old, although vines can still be infected. Extensive infections can lead to vine death (UCANR, 2000i).


Figure 24

Case study: Pierce's Disease

Historical Significance

Pierce's disease is a historically major pest problem that still persists in the Mediterranean region in the Los Angeles Basin. In the 1880s, Pierce's disease wiped out the commercial viticulture for that year in the Los Angeles Basin (Hopkins and Purcell, 2002). Then in 2000, by which Pierce's disease had caused more than $40 million in damages, the USDA declared the recurrence of Pierce's disease an agricultural emergency (Geraci, 2011).

What is it?

Pierce's disease is spread through an insect vector called the glassy-winged sharpshooter (*Homalodisca coagulata*). Pierce's disease is caused by several different strains of *X. fastidiosa*, which are carried by the glassy-winged sharpshooter (Hopkins, 2002). When a grapevine has been infected with *X. fastidiosa*, it can show several symptoms, including marginal necrosis or scorching of leaves, wilting and drying of fruit, uneven maturation of canes, decline of vigor, delayed bud break in the spring and the death of the vine (Hopkins, 2005).

Mitigation

Unfortunately, there are few mitigation options for dealing with the glassy-winged sharpshooter. Thus far, the most effective mode of managing the sharpshooter is through the aerial dispersal of pesticides (Abelli-Amen and Parfrey, 2002). Unfortunately, the majority of pesticides that have been seen to be effective are harmful, broad-spectrum pesticides. Yet, recent studies surrounding the glassy-winged sharpshooter's natural predators have provided some hope in terms of biological controls. In southeastern regions of the United States, the glassy-winged sharpshooter's eggs are parasitized by mymarid wasps, which pupate inside the eggs before chewing their way out. These host-specific mymarid egg parasitoids have proven a reasonable control method to achieve long-term, area-wide suppression. However, this biological control may be useless in agricultural landscapes such as California, due to the crop reduction caused by the irreversible damage to plant-leaf tissue and the fact that these agricultural environments are inhospitable to the natural predators (Pilkington et al., 2005).

Name of Herbicides/Pesticides/Fungicides

Table 2a.
List of Pesticides, alternative and common names of each, the chemical composition of each, and how it works within the vineyard.

Chemical Name	***Alternate Names***	***Chemical Composition/ Grouping***	***How It Works***
Neonicotind Pesticide (UFIFASE, 2005)	Acetamiprid, Clothianidin, Dinotefuran, Imidacloprid, Nitenpyram, Thiacloprid, Thiamethoxam	Toxicity class II and class III agents	The mode of action of neonicotinoid pesticides is modeled after the natural insecticide, nicotine. They act on the central nervous system of insects. Their action causes excitation of the nerves and eventual paralysis which leads to death.
Aluminum phosphide, Magnesium phosphide, Sulfuryl fluoride (Common Name: Phosphorous and Sulfur Fumigants) (USEPA, 2012a; Muhle et al., 2009)	Trade Names for Aluminum phosphide: Phostoxin, Detiaphos, Phosfume, Fumitoxin, Gastoxin, Phosfume, Weevilcide Trade Names for Magnesium phosphide: Fumi Cel, Fumi Strip, Magtoxin Trade Names for Sulfuryl fluoride: Vikane	Phosphorous and Sulfur Fumigants. Phosphorous fumigants contain aluminum and magnesium phosphide while sulfuryl fluoride is based on sulfur.	These gases are toxic when inhaled. Aluminum phosphide is also toxic if ingested in solid form since it can turn into phosphine gas.

Chemical Name	***Alternate Names***	***Chemical Composition/ Grouping***	***How it Works***
Pyrethroid (USEPA, 2012b; IDPH, 2007)	Ambush, Anvil, Ectiban, Indothrin, Pertox, Persect, Permethrin, Pyrethrin, Resmethrin, Scourge, Sumithrin	Toxicity class II and III agents, containing allethrin, tetramethrin, deltamethrin and fluvalinate	Must be applied when the target pest is present because it is chemically unstable and breaks down rapidly upon exposure to air and sunlight. Formulations that are commercially available include aerosols, dips, emulsifiable concentrates, wettable powders, granules, and concentrates for ultra low volume applications targeting mosquitoes.
Carbaryl Insecticide (LivingWithBugs, 2004; Bayer Environmental Science, 2005)	Carbamine, Denapon, Dicarbam, Hexavin, Karbaspray, Nac, Ravyon, Septene, Sevin, Tercyl, Tricarnam, and Union Carbide 7744	Carbonate family, highly toxic	Sevin has a dual mode-of-action — it works on contact and through ingestion. Sevin is non-systemic, which means it does not penetrate plant tissue — it stays on the outside.
Atrazine (USEPA, 2012c)	Aatrex, Aktikon, Alazine, Atred, Atranex, Atrataf, Azinotox, Crisazina, Farmco Atrazine, Gesaprim, Giffex 4L, Malermais, Primatol, Simazat, Zeaphos	Restricted use pesticide, due to its potential for groundwater contamination	A white, crystalline solid. Stable under normal temperatures and pressures, but may burn if exposed to heat or flame.
Azoxystrobin (Pesticides News No. 51, 2011; Kegley, Hill, Orme,& Choi, 2010)	Quadris, Heritage, Abound	Class III, slightly hazardous	Can come in the following forms: solid, free flowing granule, wettable granule. Is a systematic fungicide that is absorbed through the roots and translocated in the xylem to the stems and leaves, or through leaf surfaces to the leaf tips and growing edges.

Table 2b.
List of pesticides, the group of species that each argets, the non-target species that are subject to the effects of the pesticide, and persistence of each within the environment.

Chemical Name	*Target Species/ Group*	*Non-Targets Affected*	*Persistence in Environment*
Neonicotind Pesticide (UFIFASE, 2005)	Effective against sucking insects, but also chewing insects such as beetles and some Lepidoptera, particularly cutworms	In animals and humans, imidacloprid is quickly and almost completely absorbed from the gastrointestinal tract, and eliminated via urine and feces within 48 hours. Of the neonicotinoids, imidacloprid is the most toxic to birds and fish. Both imidacloprid and thiamethoxam are highly toxic to honeybees.	In a study on honeybees, the insecticides were also consistently found at low levels in soil -- up to two years after treated seed was planted -- on nearby dandelion flowers and in corn pollen gathered by the bees.
Aluminum phosphide, Magnesium phosphide, Sulfuryl fluoride (Common Name: Phosphorous and Sulfur Fumigants) (USEPA, 2012a; Muhle et al., 2009)	The EPA says that fumigants "destroy pests in buildings or soil [1]." Insects are targeted. Phosphorous fumigants are used for "burrowing rodent and mole control."	Sulfuryl fluoride is relatively non toxic to bees but "few precautions are necessary." Aluminum phosphide is very highly toxic for fish in lethal concentrations of less than 0.1 parts per million (ppm). Humans can be affected as well by these fumigants.	Sulfuryl fluoride has an atmospheric lifetime of 30-40 years.
Pyrethroid (USEPA, 2012b; IDPH, 2007)	Wide range of pests, broad spectrum	Can be easily airborne, affecting bees and fish.	Mammals metobilic activity quickly deactivates
Carbaryl Insecticide (LivingWithBugs, 2004; Bayer Environmental Science, 2005)	Broad spectrum chemical that targets insect and mite pests, including the leafhopper	Honeybees, rainbow and lake trout, bluegill, cutthroat, Canada geese.	Short residual life on treated crops, where insecticidal properties are retained for 3-10 days. Loss of carbaryl is due to evaporation and uptake into plants.
Atrazine (USEPA, 2012c)	Herbicide, targets weeds.	Atrazine found in groundwater, that is consumed over a long period by humans can cause adverse health effects, including tremors, changes in organ weights and damage to the liver and heart. Only slightly toxic to birds, such as mallard ducks, bobwhite quail and ring-necked pheasants. Only slightly toxic to fish, like whitefish.	Moderately to highly mobile in soils. Not very water soluble. Absorbed by plants, mainly through the roots.
Azoxystrobin (Pesticides News No. 51, 2011; Kegley, Hill, Orme,& Choi, 2010)	Fungicide that inhibits spore germination, mycelial growth and spore production of fungi. Controls downy and powdery mildew.	Slightly toxic to rats and highly toxic to fish.	Moderately persistent in soil, with a half-life of 1 to 4 weeks.

Broad Spectrum Pesticides

Broad Spectrum pesticides are a type of pesticide that are designed to kill a wide range of animals by being non-selective and highly toxic to both target and non-target species (Dlott, 2002).

Some Broad Spectrum pesticides that are used in grape growing in California can be found under the names:

- Dimethoate
- Lannate
- Sevin
- Dibrom
- Lorsban
- Omite
- Vendex
- Kelthane

To maintain a sustainable vineyard, Broad Spectrum pesticides should be used sparingly. Although they may kill pests found in the vineyard, they also have the ability to kill the pest's natural predators, which can create new pest problems (Dlott, 2002).

Reduced Risk Pesticides

Reduced-risk pesticides (UFIFASE, 2010) are ones that comply with the following criteria:

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

Reduced Risk Pesticides that are registered for grapes (Berkett and Cromwell, 2009):

- Abound
- Elevate
- Endura
- Flint
- Quintec
- Revus
- Scala
- Vanguard
- Acramite
- Assail
- Avaunt
- Clutch
- Confirm
- Intrepid
- Delegate
- Movento
- Seccess
- Venom
- Zeal, Zeal Miticide 1

Using Pesticides Selectively & Sustainably

Pesticides cannot only disrupt the intended pest, but its natural predator as well. There are several guidelines that one should follow to maintain a sustainable vineyard (Network for Sustainable Agriculutre, n.d.).

- Give natural control a chance. Before resorting to pesticide, check to see if a natural enemy (biological control) is present and capable of decreasing pests to a non-damaging level. Pesticides should be used only if pests are increasing to damaging levels and the natural enemies do not appear to be increasing too.
- Choose selective products. Try to use reduced-risk pesticides and pesticides that have shorter persistence for the least amount of ecological damage.
- Apply only when necessary.
- Reduce volumes applied. Lower volumes mean lower doses of active ingredients. The resulting greater efficacy of the smaller drops will reduce future sprays.
- Calibrate properly.
- Target the pest.
- Localize the application. Spot spraying allows natural enemies to survive in unsprayed areas.
- Time the application carefully. Spraying should be carried out at a time when pests are likely to receive a dose, but natural enemies are not.

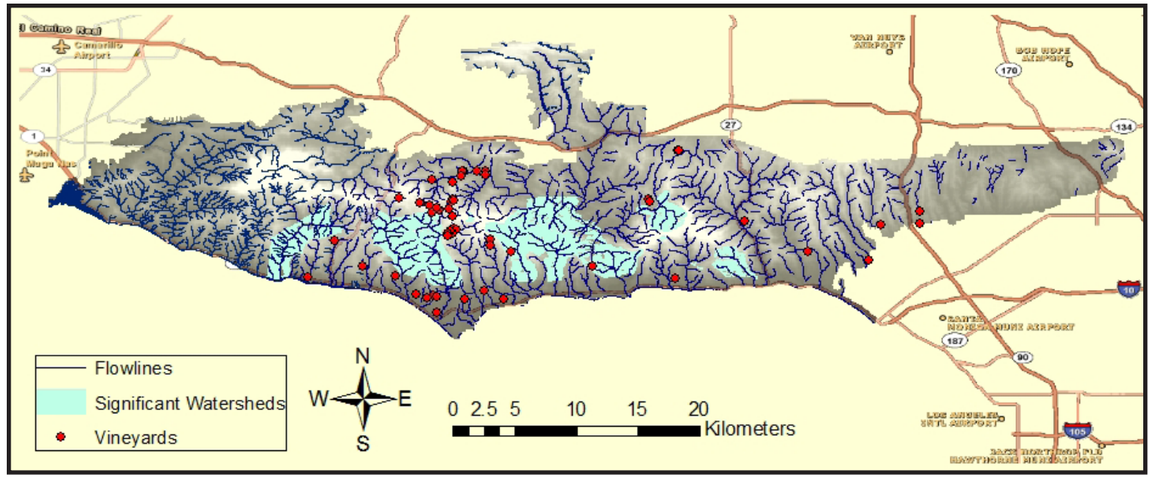
Image 4: Pesticides being sprayed. Found at: http://county.wsu.edu/asotin/nrs/noxious/Pages/Pesticide Licensing.aspx

Water.

Water is critical to the health and poductivity of a vineyard. Therefore problems associated with the resource should be deemed a high priority in vineyard management. Both the effects of the resource on the vineyard and the vineyard's effect on the resource are key components that should be addressed by the responsible land manager. In general, we plan to emphasize ways to reduce total water use through specific irrigation techniques and methods to minimize total runoff through the most appropriate cover crops.

Water & Conservation in the SMMNRA

The SMMNRA lies in a region of California that experiences a Mediterranean climate, which is characterized by a wet winter and dry summer. These regions typically receive three times as much rainfall during winter months as they do during the summertime, making it difficult to predict the annual volumes (Zalidis et al., 2002). With such wide variability in rainfall, proper management and conservation of water resources is vital to the long-term success of your vineyard. Should excessive irrigation occurs, it can lead to "increased vegetative growth leading to excessive water loss, fungal diseases and shading of grade clusters" (De Souza et al., 2005).



Map 15: Above is displayed significant watersheds, water flow lines, and locations of existing vineyards across the entire Santa Monica Mountains National Recreation Area. The border of the area is displayed with the grey background.

Techniques to Conserve Water & Improve Grape Yields

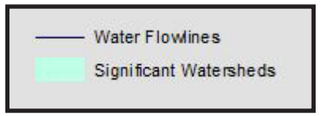
Table 3a.
Current techniques, like deficit irrigation and partial root-zone drying, have been developed to improve crop yields while reducing water use and waste.

Type of Irrigation	***What is it?***	***Benefits***	***Difficulties***
Deficit Irrigation (De Souza et al., 2005; Delahera et al., 2007)	Regulated form of water stress that deliberately withholds irrigation water and imposes water stress at crucial points in fruit development throughout the growing season.	• Reduce vine vigor and competition at the growing tips for carbohydrates, which can increase grape and wine quality • Secures and stabilizes grape production without affecting the quality or quantity of wine produced	Requires precise control of water, which can be difficult to maintain.
Partial Root-Zone Drying (Delahera et al., 2007)	Allows one half of the root system to dry out while the other half is kept under frequent irrigation. Then, after a specified time, the irrigation is switched so the dry half is irrigated and the irrigated half becomes dry.	• Dehydrated roots send a chemical signal called abscisic acid to the rest of the plant, which reduces the stomatal conduction, transpiration and vegetative growth • Increases water efficiency in grapevines by 50%	Can be costly if you do not already have some form of drip irrigation in place

Reducing Vineyard Impacts on Aquatic Systems

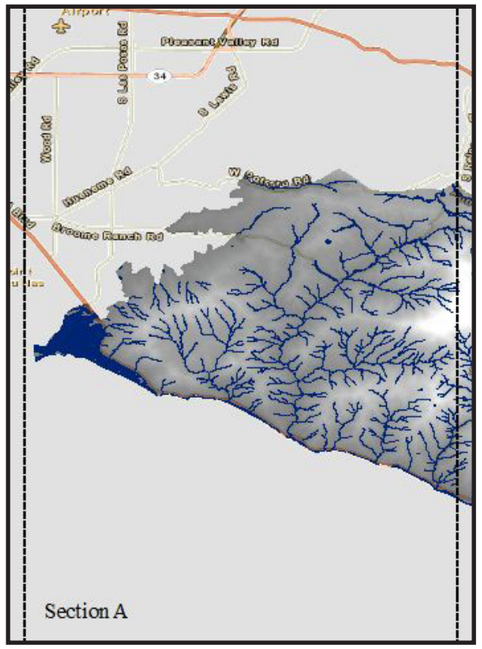
The health of riparian and aquatic ecosystems should also be a goal of a vineyard. Several watersheds cover the Santa Monica Mountain North Area Plan, including Malibu Creek, Arroyo Calabasas, Topanga Canyon, Las Trancas Creek, Zuma Creek, and Los Alisos Creek. The most significant of the six is Malibu Creek, because it is the second largest watershed draining into Santa Monica Bay, and the watershed with the largest area of significant natural resources (Los Angeles Board of Supervisors). The waters entering these watersheds all eventually make their way into Santa Monica Bay.

For example, pesticides, fertilizers, and other treatments used in viticulture can infiltrate waterways during rain events. Many of these chemical pesticides composed of copper, zinc, arsenic, simazine and diuron. All of these are compounds are potentially toxic to algae and other aquatic primary producers when introduced to the natural environment (Devez et al., 2005).



Legend 3: The displayed legend shows water flow lines and significant watersheds. This legend is valid for maps 16-20.

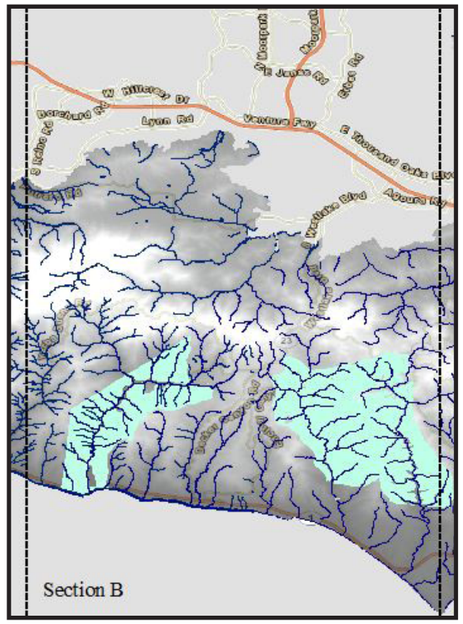
Map 16: The map depicted on the right shows Section A, which represents mostly Ventura County territory. The heavy blue section is a smaller watershed and flow lines are shown for the rest of the area to help illustrate where rain runoff will lead.

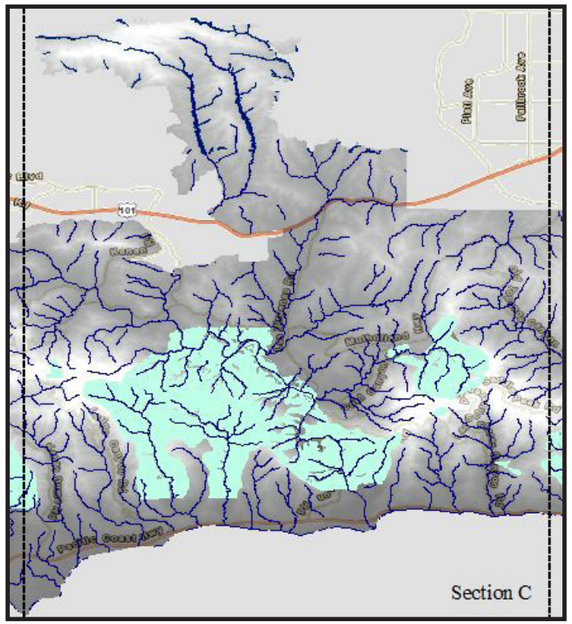


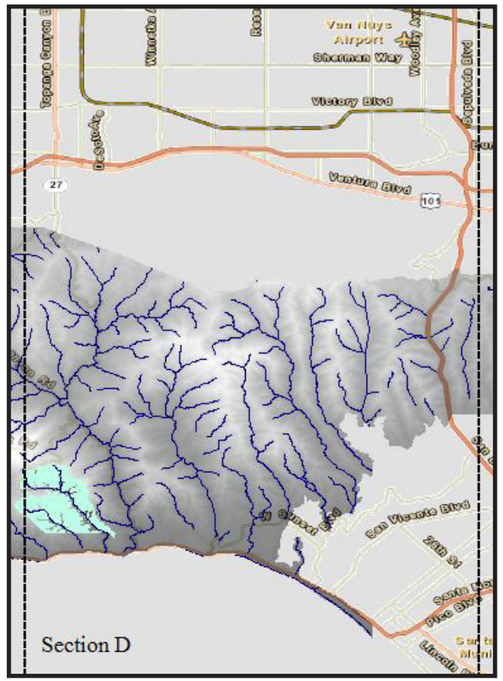
Techniques to Reduce Runoff

Table 3b.

	What is it?	*Benefits*	*Difficulties*
Infrastructure and Barriers (Harrison et al. 2005)	Permeable materials to construct private sidewalks, driveways, parking lots and interior roadway	Directs water flow toward vegetated areas	• Cost
Cover Crops (Llewellyn, 2006; Romero-Diaz et al., 1999; Baumgartner et al., 2008; Janzen & McGinn, 1991; Hirschfelt, 1998; Fredrikson, 2011; Monteiro & Lopes, 2007; Fredrikson, 2011)	Using perennial species is recommended, such as low, slow growing grass species and Cistus species, which are to be planted in the vineyard middles and occasionally in vine rows.	• Vineyard weed reduction without the use of herbicides • Moisture retention • Decline in erosion (water exacerbates wind and tillage, amplifying soil erosion, which can often cause an all-out collapse)	• Reduced soil aeration, which leads to nitrogen loss (however, a reasonable amount of nitrogen loss is tolerable in vineyard systems) • Annual cover crops have been seen to fail during June when certain species re-germinated, leaving rows barren and vulnerable to evapotranspiration or potential flooding







Map 17 (top left) **Map 18** (top right) **Map 19** (bottom left) **Map 20** (bottom right): he maps displayed above show significant watersheds and water flow lines for Sections B-E. These areas are comprised almost entirely of Los Angeles County territory. They should be used to tell where rain runoff will lead and which significant watersheds will likely be affected.

Affected Wildlife.

Habitat Requirements

The Santa Monica Mountains National Recreation Area (SMMNRA) is home to a diverse range of species, including aquatic species, amphibians, smaller mammals, birds, reptiles, large carnivores and a multitude of different plant species (National Park Service, 2005). Some of these species are endangered, threatened or endemic and need to be protected to maintain the SMMNRA ecosystem. Vineyards are a potential threat to this diversity through adversely affecting water quality, habitat fragmentation, and use of poisonous chemicals. By addressing these potential problems, we have provided a comprehensive guide of what to look for and in what ways you can mitigate the effects of your vineyard.

Aquatic Species & Amphibians

Water Quality

Fish and amphibians are mainly affected by changes to the health of the watersheds (ForEverGreen Forestry, 2010). Runoff of chemical pesticides and sedimentation from soil erosion are the main factors contributing to decline in populations of several aquatic and amphibian species (De Solla et al, 2002).

Smaller Mammals, Birds, & Reptiles

Habitat Fragmentation

The effect of habitat fragmentation upon wild animals is a major concern presented by the development of the native landscape into vineyards. Habitat fragmentation can affect species in many ways, including loss of suitable habitat, inbreeding and loss of genetic diversity (Templeton et al, 1990), effects on natural dispersal (Stow et al, 2001), edge effects, all of which have negative effects on the survivability of the species. A fragmented landscape is composed of "patches" of native habitat and the surrounding "matrix," usually the human altered portions between patches. Vineyards are to be considered as a matrix, composed of vegetated space. Even if vineyards are a form of vegetation, they still have the ability to isolate habitat patches and disrupt normal species interactions. Many biologists support the formation and preservation of "corridors" of native habitat between patches as a solution to prevent isolation (Ewers, 2006). Where appropriate, leaving some native vegetation between areas of vineyard that connect larger patches surrounding the vineyard may aid in facilitating dispersal of species throughout the area despite the presence of the vineyard.

Pesticides

Many common insecticides, herbicides, and fungicides have adverse effects on non-target species. Integrated Pest Management (IPM) is a good way to avoid causing harm to non-target species (see more on IPM in the Pests and Pesticides section). Using less toxic chemicals and eliminating use of chemicals whenever possible is beneficial to the health of the ecosystem surrounding the vineyard.

Large Carnivores

Habitat Requirements

The Santa Monica Mountains are home to multiple species of large carnivores, including mountain lions and bobcats. The SMMNRA contains enough contiguous natural habitat to support the large home ranges that these animals require. A concern then, is the effect that vineyards might have on large carnivores. According to National Park Service biologist Seth Riley, large carnivores would likely be minimally affected by the presence of vineyards in the SMMNRA (Riley, 2012) . Mountain lions and bobcats would still be able to move through vineyards, because although it is not native habitat, a vineyard is still vegetated space. Provided that no predator-excluding fences are built around the vineyard, these large carnivores would likely tolerate this type of land-use change.

Rodenticides

Riley emphasized that the biggest threat to large carnivores is use of rodenticides in the SMMNRA. Anticoagulant rodenticides are currently affecting the majority of large carnivores in the area (Figure 25). These chemicals build up and cause death in mountain lions and bobcats, and their use is highly unadvisable. As an alternative to rodent poisons, we suggest using a natural predator to control rats and mice instead. Installing an owl nesting box (http://www.hungryowl.org/) or using another method to attract owls to your vineyard may be appropriate. The SMMNRA is home to several species of owls, all of which naturally prey on the rodents that might be a nuisance in a vineyard.

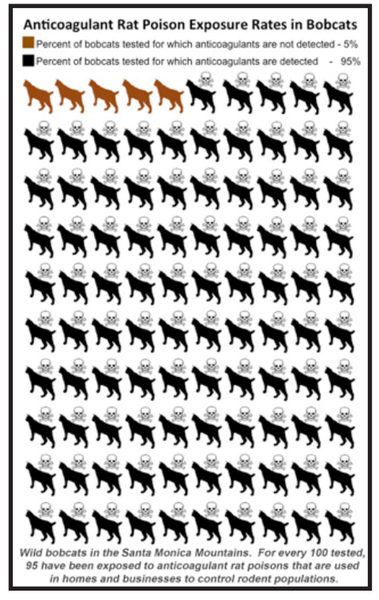


Figure 25: Shows high exposure to anticoagulants in bobcats, even those sampled from protected areas. Figure created by Laurel Serieys using data generated by Riley et al., 2007 and Serieys et al., unpublished data. Found at http://www.urbancarnivores.com/poisons/

Below is a compiled list of species found in the SMMNRA that may be sensitive to changes in the natural landscape. The tables include species name and picture, sensitivity listing, description of their preferred habitat, and possible threats to local populations. Not all of the species are federally or state listed as endangered, we instead included species based on prevalence of threats. Table 4a shows mammals and birds, and Table 4b shows reptiles, amphibians, and fish.

Mammals & Birds

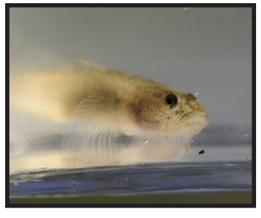
Table 4a.

Species	***Status***	***Habitat***	***Threats***
Mountain Lion (Puma concolor)	Not listed, but locally are confined to SMMNRA	Utilize the entire park area, habitat typically same as that of their prey. Often use streams and ridges as corridors.	Loss of habitat due to development, rodenticides
Bobcat (Lynx rufus)	Not listed, but locally are confined to SMMNRA	Utilize entire park area; prefer rocky ledges and areas of dense vegetation.	Habitat loss, rodenticide use
Light-footed Clapper Rail (Rallus longirostris levipes)	Endangered	Saltmarsh. Breeding ground located within the park, prefer to breed in stands of Spartina species of marshgrass	Habitat loss, especially breeding ground habitat loss
Southwestern Willow Flycatcher (Empidonax traillii extimus)	Endangered	Scrubby, brushy areas, open woodland, open second growth areas	Habitat destruction and loss
Least Bell's Vireo (Vireo bellii pusillus)	Endangered	Moist woodland areas, willows (Salix spp.)	Loss and destruction of preferred riparian habitat areas

All information found using NatureServe Explorer, 2012.

Reptiles, Amphibians, Invertebrates, & Fish

Table 4b.



Species	***Status***	***Habitat***	***Threats***
California Red-legged Frog *(Rana aurora draytonii)*	Threatened, have already mostly disappeared from the SMMNRA	Deep pools	Deposition of sediment in the deep pools they require, loss of riparian habitat
Southwestern Pond Turtle *(Clemmys marmorata pallida)*	Species of Concern	Semi-aquatic. Found in ponds, streams, marshes, and lakes	Sedimentation of local streams, loss and destruction of riparian habitat including loss of canopy cover
Southern California Steelhead Trout *(Oncorhynchus mykiss)*	Endangered	Return to natal streams in Malibu, Topanga, and Arroyo to spawn	Loss and destruction of natal spawning streams in the SMMNRA is negatively affecting steelhead trout populations
Riverside Fairy Shrimp *(Streptocephalus woottoni)*	Endangered	Vernal pools, ephemeral ponds, local SMMNRA watersheds	Destruction of watershed habitats, including sedimentation
Tidewater Goby *(Eucyclogobius newberryi)*	Endangered	Coastal lagoons, vegetated pools of slow moving streams, can live in fresh or brackish water	Destruction of estuarine habitat, including sedimentation. It is difficult to repopulate areas where species has been extirpated

All information found using NatureServe Explorer, 2012.

Policy.

The SMMRA is composed of the Los Angeles and Ventura counties, both of which have their own policies and regulations that must be adhered to. For convenience, we have categorized different regulations into the following topics:

- Land use
- Fire safety
- SEAS and SERAS
- Protected trees
- Rare plants and animals
- Pesticide use
- Water Quality

Each topic is then further organized based on the different governing county. We have provided links to the official sites where these policies are explained in further detail.

Land Use

The most important way to comply with land use policy is to know the jurisdiction under which your property lies. From there, it is useful to become familiar with your region's General Plan or, if available, its Local Coastal Plan (LCP). You should also confirm whether your property is located in a region appropriate for agricultural zoning. Listed below are links to specific regulations and codes.

Los Angeles County Department of Regional Planning

For information on the framework and goals of land use policy in Los Angeles County, refer to the ***General Plan*** and download the section on Land Use, found here:
http://planning.lacounty.gov/generalplan/existing

Land use policies in certain areas can be based on more specific adopted plans, such as Malibu's LCP and the Santa Monica Mountains' North Area Plan.
For a complete list of adopted plans and to view the full plans: http://planning.lacounty.gov/plans/adopted

Title 22:
Title 22 is the zoning ordinance of the Los Angeles County that sets regulations for planning and zoning. Within this code, the suitability of each zone has been considered for the area requirements, density of land occupancy, and the necessary, proper and comprehensive groupings and arrangements of the various industries, businesses and population. http://search.municode.com/html/16274/_DATA/TITLE22/index.html

For agricultural zoning regulations (Title 22):
Agricultural zones are established to permit a comprehensive range of agricultural uses. In the agricultural zoning regulation, the designated uses within agricultural zones and restrictions can be found.
http://search.municode.com/html/16274/_DATA/TITLE22/Chapter_22_24_AGRICULTURAL_ZON.html

For a summarized list and explanation of the agricultural zones and their permitted use according to Title 22:
http://planning.lacounty.gov/luz/summary/category/agricultural_zones/

County of Ventura Planning Division

Land use policy is based off the ***Ventura County General Plan.***
http://www.ventura.org/rma/planning/General_Plan/general_plan.html

Area Plans for certain locations provide long range plans, which comply with County policies and are the basis for future land use development in a specifically defined area. Each Area Plan includes detailed goals, policies and programs that may differ according to location.
http://www.ventura.org/rma/planning/General_Plan/area_plans.html

The Non-Coastal Zoning Ordinance:
Information on uses in land zones starts on Article 5 (page 41).
Information on animal keeping begins on page 90.
Information on agricultural sales facilities starts on page 108.
http://www.ventura.org/rma/planning/pdf/zoning/VCNCZO_current.pdf

The Coastal Zoning Ordinance:
Information on the purposes of zones starts on Article 3 (page 20).
Information on the permitted uses starts on Article 4 (page 22).
http://www.ventura.org/rma/planning/pdf/zoning/coastal_zone_ord.pdf

County Coastal Area Plan:
The County Coastal Area Plan ensures that local government's land use plans, zoning ordinances, zoning maps and implemented actions meet local requirements. It addresses topics such as shoreline access and public trails, development in scenic areas, coastal hazards and coastal bluffs, ESHAs, cultural resources, transportation and public services.
http://www.ventura.org/rma/planning/Programs/local.html

Ventura County Coastal Zoning Ordinance, 2008:
The Coastal Zoning Ordinance consists of the comprehensive zoning plan and regulations for the unincorporated coastal zone of the County of Ventura. It serves to protect and promote the public health, safety and general welfare and to provide the environmental, economic and social advantages that result from an orderly, planned use of resources. It also seeks to protect public and private property, wildlife, marine fisheries and other ocean resources.
http://www.ventura.org/rma/planning/pdf/zoning/coastal_zone_ord.pdf

The City of Malibu

Malibu General Plan:
Malibu's General Plan is a guide to development in the following areas: land use, conservation, open space and recreation, circulation and infrastructure, safety and health, noise and housing.
http://qcode.us/codes/malibu-general-plan/

Local Coastal Program:
The purpose of Malibu's LCP is to, among other things, assure orderly, balanced utilization and conservation of coastal zone resources, protect, maintain and where feasible, enhance and restore the overall quality of the coastal zone environment.
http://qcode.us/codes/malibu-coastal/

Under the ***Local Implementation Plan*** (chapter 3), you can find information pertaining to the zoning designations and permitted uses, as well as information on agricultural uses in the LCP. Here you will find the specifics on ESHAs (Environmentally Sensitive Habitat Areas), the use of reclaimed water, greenhouse gases and water quality.

Santa Monica Mountains

The North Area Plan:
The North Area Plan ranges from the unincorporated portions of the SMMNRA west of the city of Los Angeles to north of the Coastal Zone boundary. The primary role of this Area Plan is to provide more focused policy for the regulation of development. It also refines the policies of the county-wide General Plan as it applies to this planning area. It serves to, among other things, to identify the community's environmental, social and economic goals, establish within local government the ability to respond to problems and opportunities concerning community development and create a basis for subsequent planning efforts.
http://planning.lacounty.gov/view/santa_monica_mountains_north_area_plan/

Local Coastal Program:
The Local Coastal Plan ranges from the unincorporated area west of the City of Los Angeles to east of Ventura County and south of SMMNRA North Area (excluding the City of Malibu). The LCP is composed of the following elements: conservation and open space, safety and noise, land use and housing, circulation and public facilities.
http://planning.lacounty.gov/coastal
http://planning.lacounty.gov/assets/upl/project/coastal_coastal-zone-plan-with-maps.pdf

Fire Safety

Brush clearance and fuel modification are essential aspects of firebreaks and defensible space surrounding your property. However, the amount and intensity of clearing necessary depends on property terrain and the volatility of the fuel surrounding your property and location. A careful assessment of your specific site will enable you to create a firebreak that protects the natural resources of the surrounding environment as well as your property. For guidelines and other information see the links below.

General Guidelines

A Road Map to Fire Safety: How to Create Defensible Space in the Santa Monica Mountains:
This document features the best management practices to create a defensible space, while protecting wildland.
http://fire.lacounty.gov/forestry/RoadMaptoFireSafety.pdf

Sustainable and Fire Safe Landscapes (SAFE):
This document is concerned with the fire safety in the wildland-urban interface. Its goal is to provide ways to protect the home with the use of fire-resistant building materials and architectural feature, good practices to avoid starting fire in and around the home, and a good fire response plan.
http://ucanr.org/sites/SAFELandscapes/
http://ucanr.org/sites/SAFELandscapes/files/93415.pdf

County of Los Angeles Fire

Title 32:
Title 32 is referred to as the fire code that established regulations affecting or relating to structures, processes, premises and safeguards regarding: fire hydrant systems, water supply, fire equipment access, posting of fire equipment access, parking, lot identification, weed abatement and combustible brush and vegetation that represents an imminent fire hazard, debris abatement, combustible storage abatement, hazardous material storage and use, open-flame and open-burning and burglar bars.
http://search.municode.com/html/16274/index.htm

Fuel Modification:
This plan's objective is to reduce the radiant and convective heat and providing valuable defensible space for firefighters to make an effective stand against an approaching fire front. It is broken up into specific zones within a property that are subject to fuel modification.
http://fire.lacounty.gov/forestry/FuelModification.asp

Brush Clearance:
This plan legally declares both improved and unimproved properties as a public nuisance, and where necessary, requires the clearance of hazardous vegetation.
http://fire.lacounty.gov/forestry/BrushClearance.asp

Ventura County Fire

Brush Clearance:
This is a guide to maintain your landscape, yard and roof in order to reduce the risk of wildfires.
http://fire.countyofventura.org/Prevention/WildfirePreparedness/BrushClearanceGuide/tabid/169/Default.aspx

Ready, Set, Go! ***Your Personal Wildfire Action Plan:***
This document addresses how to prepare and be ready in the event of a fire if you live in the wildland urban interface or the ember zone.
http://fire.countyofventura.org/LinkClick.aspx?fileticket=F16UdBq8SxM%3d&tabid=231

Ready, Set, Go! ***Wildfire Preparedness for Farmers, Ranchers and Growers:***
This document is specifically geared toward helping farmers and ranchers meeting the challenges to protect their property and livelihood from fires.
http://fire.countyofventura.org/LinkClick.aspx?fileticket=xDCkAK3DngE%3d&tabid=231

SEAs & SERAs

SEAs (Significant Ecological Areas) and SERAs (Sensitive Environmental Resource Areas) are used to describe sensitive habitats and species. SEAs and SERAs near or in your property should be taken into consideration when developing. SERAs are categorized into 6 different classifications: ESHAs, Disturbed Sensitive Resource Areas, Significant Watersheds, Malibu/Cold Creek Resource Management Area, Wildlife Corridors, and Significant Woodlands. An ESHA is the SERA category with "the highest level of resource protection." According to the Santa Monica Mountains Local Coastal Program, the Coastal Act defines an ESHA as having rare or valuable plant, animals, or habitats, and an area that "…could be easily disturbed or degraded by human activities and developments." (County of Los Angeles Department of Regional Planning, 2007)

Los Angeles County, SEA Program:
SEAs are ecologically important land and water systems that support valuable habitat for plants and animals, often integral to the preservation of rare, threatened or endangered species and the conservation of biological diversity in the County. Although a SEA does not change the land use designation or zoning of a property, a SEA CUP is required for development.
http://planning.lacounty.gov/sea/

Rare Plants & Animals

You should also take notice of rare plants and animals in or around your property. The California Natural Diversity Database (CNDDB) "is a program that inventories the status and locations of rare plants and animals in California" (Department of Fish and Game, n.d.) and can be used to identity these species.

CNDDB website: http://www.dfg.ca.gov/biogeodata/cnddb/

Trees

In addition to federally endangered species, certain trees are protected by the City of Los Angeles, Ventura County, and other cities. In particular, Oak, Southern California Black Walnut, Western Sycamore, and California Bay are protected in the City of Los Angeles.

TreePeople:
TreePeople is a non-profit based in Los Angeles that unites the power of trees, people and technology to grow a sustainable future for Los Angeles. Within this document, you can find information on protected trees and their characteristics that qualify them to be protected.
http://clkrep.lacity.org/councilfiles/03-1459-s1_ord_177404.pdf

Oak Tree Ordinance:
Below is a list of the oak trees that are protected in the Los Angeles County. Under the Oak Tree Ordinance, it will not allow for directly or indirectly pruning or impact of trees for development. It will however, allow maintenance of pruning in limbs greater than two inches in diameter and other arboricultural treatments to enhance the general health, vigor and safety of oak trees.
http://planning.lacounty.gov/view/oak_trees_in_los_angeles_county/
http://planning.lacounty.gov/view/oak_tree_permit_ordinance_amendment

County of Ventura: Tree Protection Ordinance:
This ordinance applies to the pruning, removal, trenching, excavation or other encroachment into the protected zone of protected trees in unincorporated areas.
http://www.ventura.org/rma/planning/permits/tree.html

Geographic Pesticide Use Limitations, EPA

Because many threatened and endangered species are aquatic or dependent on riparian habitat, (National Park Service, 2005) caution should be used when using pesticides or other chemicals near waterways, or other threatened or endangered species' habitats.

Endangered Species Protection Bulletins:
This EPA sponsored site contains information on pesticide use limitations for the protection of endangered or threatened species and their designated critical habitat.
http://www.epa.gov/oppfead1/endanger/bulletins.htm

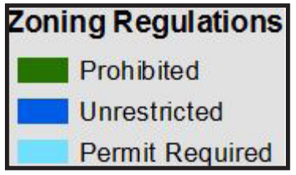
Title 12.24: Insecticides and Pesticides:
According to the Los Angeles County Code, certain insecticides have designated uses. These are insecticides that belong to the chlorinated hydrocarbon group known as aldrin, BHC, DDD, DDT, dieldrin, endrin and heptachlor.
http://search.municode.com/html/16274/index.htm

Water

Water quality is important for a healthy environment and a healthy, productive vineyard. It is in your best interest to maintain high water quality on your property and in the area surrounding your property.

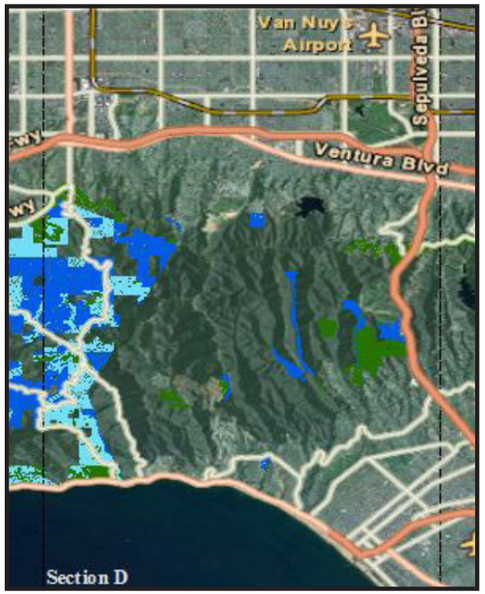
Stormwater Pollution Mitigation Best Management Practices:
In Appendix H of the Proposed Santa Monica Mountains Local Coastal Program Technical Appendices best management practices are suggested using three management strategies. These strategies are site design, source control and treatment control.
You can minimize polluted runoff by implementing Best Management Practices (BMPs).
http://planning.lacounty.gov/assets/upl/project/coastal_technical-appendices-with-maps.pdf

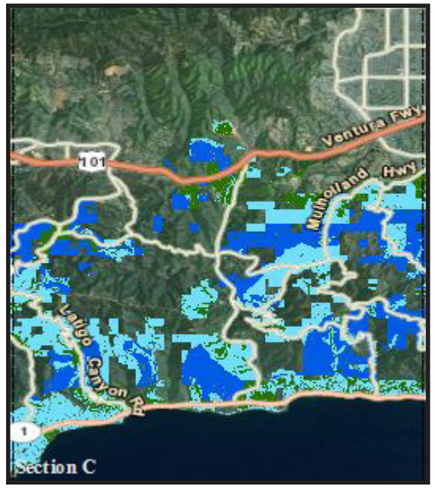
Regional Water Quality Control Board:
The RWQCM regulates water quality in the SMMNRA. Their website is a good source to refer to, if you are in doubt if you are following water quality regulations.
http://www.waterboards.ca.gov/rwqcb4/

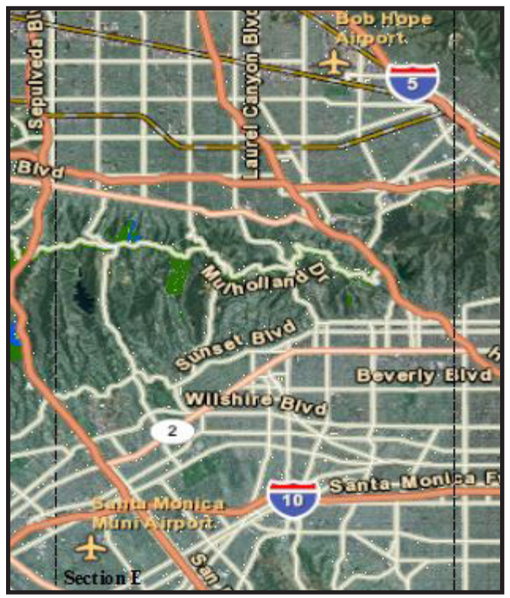


Legend 4: The above legend is valid for maps 21-24. It shows prohibited, unrestricted, and permit required color classifications.

Map 21: The map displayed at right shows zoning restrictions for agriculture in the Santa Monica Mountains for L.A. County areas. Zoning data for Ventura County will not be available in this document. Information is based on available zoning data from each city within the area and Los Angeles County. Certain sections of land were not available at the time this map was created.







Map 22 (above) **Map 23** (top right) **Map 24** (bottom right)**:** The maps depicted above show zoning regulations for Sections C-E based on data available at the time these maps were created. Significant portions of the area are not displayed here, but this does not necessarily mean that no zoning regulations exist for the given area.

Conclusion.

In this document we outline the different vineyard management practices and the degrees to which they affect the environment. The information provided is broken up into five areas: soil, pests and pesticides, water, affected wildlife, and policy. The biggest concept we would like to emphasize is that vineyard owners should put forth their best effort the keep chemicals within their boundaries and prevent them from entering waterways.

Each aspect of management contributes to this overall goal. With respect to soil, cover cropping is a good solution to improve soil structure and prevent erosion. Monitoring soil nutrient levels to choose a fertilizer that is appropriate for the soil type can aid in avoiding excess nutrient runoff to nearby streams. When dealing with pests in vineyards, natural control of pests is suggested whenever possible, and Integrated Pest Management techniques are preferred to broad-spectrum pesticide application. Due to the importance of water as a resource in all aspects of life, irrigation practices that conserve water as much as possible are extremely important. Drip irrigation and partial root-zone drying are recommended methods.

Land use change from native habitat to vineyard has the potential to negatively affect local wildlife. Suggestions to avoid ecosystem degradation include observing fertilization, pesticide use, and irrigation recommendations to preserve riparian areas, as well as leaving corridors of native habitat between vineyard patches to preserve habitat connectivity. Rodenticides should be avoided to prevent harm to large carnivores and predatory birds. Existing local government policies should be observed and followed, as many are in place to protect the landscape.

While we were able to learn about viticulture and suggest management practices that we feel are appropriate for preserving the health of the SMMNRA, more research is needed. In order to fully understand both the immediate and long-term effects that vineyards have on the landscape, more site-specific data is required. Areas for further study include site-specific vineyard soil sampling, the measurement of water quality under different management techniques, pest surveys, and investigation into appropriate vineyard patch size that minimizes habitat fragmentation. Current policies in place in the SMMNRA do not specifically address the issue of vineyards in this area, but if vineyards continue to expand, policies might change or need to change in the future.

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