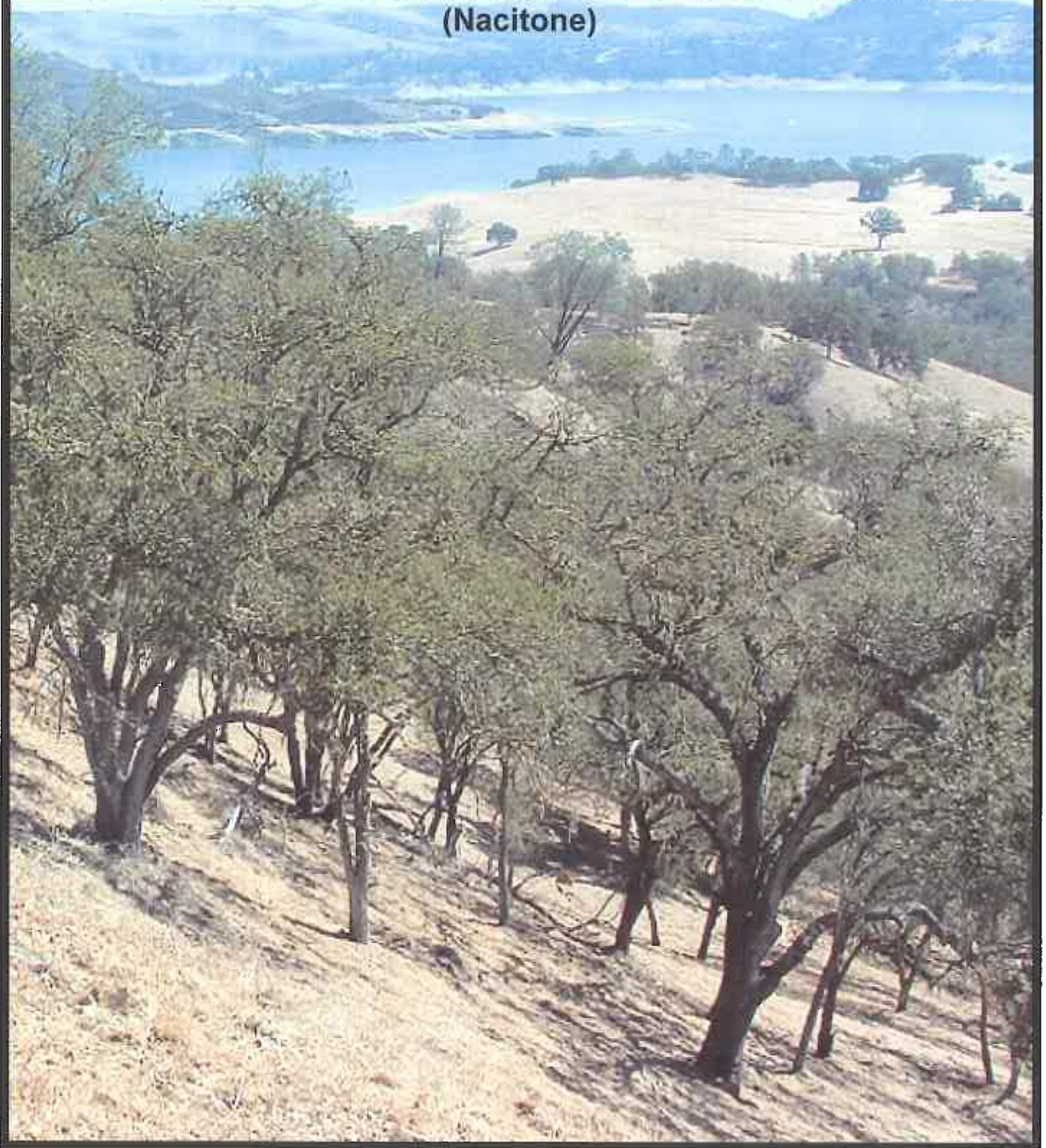


Grazing Lands Management Plan
for Monterey County Water Resources Agency land
within the Nacimiento and San Antonio River Watersheds
(Nacitone)



Prepared by the Upper Salinas-Las Tablas Resource Conservation District

FINAL Draft August 2008

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EXECUTIVE SUMMARY

The primary objective of the Grazing Lands Management Plan (the Plan) is to emphasize the utilization of Best Management Practices (BMPs) on land owned by the Monterey County Water Resources Agency (MCWRA) in order to reduce nonpoint source pollution from entering the water bodies of Nacimiento and San Antonio watersheds. Although the plan covers only properties owned by MCWRA around Nacimiento and San Antonio Reservoirs, many practices can be applied to other lands. The plan is the result of the cooperative effort of MCWRA, Upper Salinas-Las Tablas Resource Conservation District covering the properties owned by MCWRA around Nacimiento and San Antonio Lakes (also referred to as reservoirs).

The Plan is intended as a landscape-level management tool. While other tools such as controlled burns and chemical spraying (to fight invasive weeds) were considered, the Plan recommends livestock grazing as the primary management tool for MCWRA land. The Plan finds that cattle grazing, if conducted properly, can have the following benefits:

- Reduce fuel load for potential fires,
- Improves grass regeneration,
- Improves habitat for many animal and plant species,
- Reduces encroachment of noxious weedy species, and undesirable types of plants,
- and improved maintenance of grasslands and oak woodland diversity.

Issues addressed in the Plan include:

- Degradation to MCWRA land from trespassing, trash, human and animal waste and soil erosion,
- Grazing below "High Water Mark",
- Woodlands and understory,
- Corrals and fencing,
- Livestock water,
- Wildlife habitat,
- Forage production and condition of existing Residual Dry Matter (RDM),
- Soil erosion including road caused erosion,
- Lessee contract limitations:

As a guide for attaining the specific goals and objectives of MCWRA and current lessees, the Plan provides 27 different strategies for consideration. The strategies range from those that will require substantial financial support to those that are primarily policy related. The plan sees the strategies being adapted to each area and will likely vary from one lease property or area to another. Also, the Plan is a "living document" and the management strategies should be reassessed as conditions and land uses change.

Review Draft #8

Nacitone
Grazing Lands Management Plan
for Monterey County Water Resources Agency land
within the Nacimientos and San Antonio River Watersheds
(Nacitone)

INTRODUCTION

The Grazing Lands Management Plan (Plan) addresses land owned by the Monterey County Water Resources Agency (MCWRA) within the Nacimientos River and San Antonio River watersheds in southern Monterey County and northern San Luis Obispo County. MCWRA operates the Nacimientos and San Antonio Reservoirs for flood control, ground water recharge and to control salt water intrusion near Monterey Bay. While these reservoirs are impounded by large earthen dams, most maps and planning documents describe them as “lakes.” These terms are used interchangeably in the Plan.

The Plan is part of a comprehensive Integrated Watershed Management Plan (IWMP) being drafted for the Nacimientos River Watershed and the San Antonio River Watershed. The IWMP is a community-wide planning effort, funded by the State Water Resources Control Board (SWRCB) and managed by MCWRA. The Plan will be incorporated into the goals and strategies being developed for the IWMP. The Plan provides guidance for the MCWRA to incorporate Best Management Practices (BMPs) in order to comply with the goals of the Clean Water Act (1972) by reducing nonpoint source pollution entering the water bodies (streams, rivers, lakes and wetlands) within the Nacimientos and San Antonio watersheds. It is hoped that recommendations in this report, as they may be implemented by the MCWRA Board of Directors, can be used as a model for good grazing practices throughout the watershed.

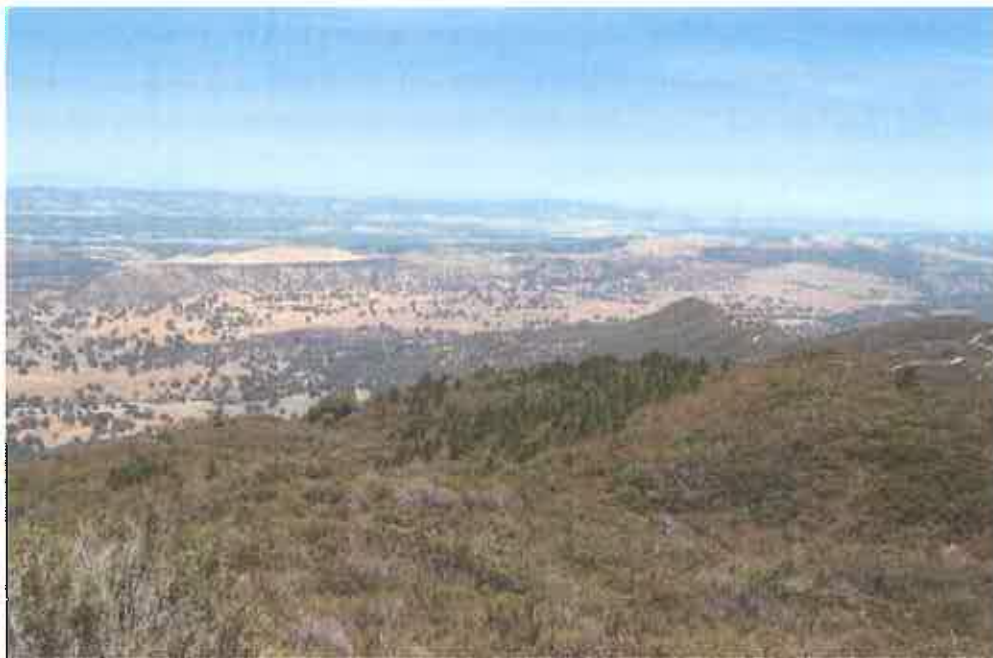
The Plan also implements the Goals and Objectives identified in the “California Rangeland Water Quality Management Plan” (CRWQMP) approved by the State Water Resources Control Board (SWRCB) in 1995. The CRWQMP was prepared by the California Association of Resource Conservation Districts (CARCD) in collaboration with the SWRCB, California Department of Forestry (CDF), California Board of Forestry and Fire Protection Range Management Advisory Committee (RMAC). It is the primary rangeland water quality plan for California. The premise of the CRWQMP is to foster a cooperative effort, spearheaded by the Natural Resources Conservation Service (NRCS) and the Resource Conservation Districts that serve the various regions of California. This Plan is a key building block in the implementation of the CRWQMP.

In addition, the Plan implements many of the goals and strategies of other planning documents for the region, including the Upper Salinas River Watershed Action Plan (WAP). The WAP, prepared by the Upper Salinas-Las Tablas Resource Conservation District (US-LT RCD) under the guidance of the SWRCB, is a comprehensive watershed management plan covering the 2,000 square mile area of the upper reaches of the Salinas River. The WAP was the result of numerous public Task Force meetings, studies of water quality, riparian vegetation, channel morphology, and habitat. It was accepted by the SWRCB in June 2004. The Nacimiento River Watershed is part of the region addressed by the WAP. Water quality and wildlife habitat strategies that are addressed in the Grazing Management Plan include:

- Improvement of water quality by the utilization of Beneficial Agricultural Management Practices (BAMPs) by land managers
- Improvement water quality through the provision of technical assistance to farmers
- Maintenance of wildlife habitat and fisheries within the planning area

Focus of the Plan

The Plan primarily deals with the management of land resources for the purpose of conservation of natural resources. The Plan does not attempt to address the management of the recreational and camping land uses. The plan recommends strategies and best management practices for the improvement of water quality and the maintenance of biodiversity within the properties owned by MCWRA.



View of watershed looking toward the southeast from the Santa Lucia Mountains

MCWRA requested the US-LT RCD and its partners to evaluate existing conditions, meet with the ranch managers, provide an Ag Water Quality Short Course for the ranch managers, and assist in preparing the grazing management plan for their properties. This project is the result of cooperative efforts of MCWRA, US-LT RCD, Natural Resources Conservation Service (NRCS), San Luis Obispo County Ag Extension Office, University of California Cooperative Extension and ranch managers.

Potential Benefits of the Plan

The plan recommends strategies and best management practices for the improvement of water quality and the maintenance of biodiversity within the properties owned by the MCWRA. As a landscape-level management tool, livestock grazing, if conducted properly, can have the following benefits:

- Reduces fuel load for potential fires
- Improves grass regeneration
- Improves habitat for many animal and plant species
- Reduces encroachment of noxious weedy species
- Limits woody plant encroachment
- Maintains a diversity of grasslands and oak woodlands

To attain the specific goals and objectives of the MCWRA and current ranch managers, a number of strategies were developed. It should be remembered that the strategies identified in the Plan will need to be adapted to each grazing area and will likely vary from one lease property to another. Also, the Plan is a "living document" and the management strategies should be reassessed as conditions and land uses change. It is also recognized that MCWRA lease boundaries may not closely match the most logical grazing units. In these cases, opportunities for collaboration exist with adjoining property owners.

The Plan is a tool to be used by the MCWRA and the ranch managers. It should be remembered that good land stewardship is the responsibility of everyone. Many of the problems and impacts that are described in this plan are being caused by neighbors and visitors. These impacts cannot be resolved without the cooperation of these people.

GENERAL CHARACTERISTICS OF THE PROPERTIES

The MCWRA owns a total of approximately 25,000 acres (almost 40 square miles) of land in and around the reservoirs. This is roughly 5 percent of the entire Nacimiento and San Antonio River watersheds. Nearly 16,000 acres are currently being leased to ranchers with the remainder in recreational camping areas, grassland and oak forest. The land surrounding the two lakes has varied soil, rainfall, slope size and configuration characteristics that preclude the establishment of a single set of management criteria. The Plan summarizes these characteristics and identifies management measures to improve the conditions of the natural resources, soil, water and habitat.

There are currently eight (8) separate grazing leases on MCWRA owned land. The leases are shown on the maps at the end of this section. The MCWRA also owns properties that are used for recreational purposes at both lakes. Additional information regarding these properties is provided in the Plan Appendices.

Terrain and Predominant Vegetation

The planning area is comprised of the two lakes surrounded by rolling to mountainous grasslands, oak/pine forests and numerous riparian areas. The leases and recreation properties are generally gentle to steep slopes. There are a few flat grassy meadows, some within the portions of the leases located below the "high water mark." "High water mark" describes the approximate full condition of each of the two lakes (800 feet elevation Mean Sea Level {MSL}) for Nacimiento lake and 780 feet for San Antonio lake. Additionally, it is important to note that MCWRA owns a Floodage Easement which allows them to flood all lands around Nacimiento lake up to 825 feet MSL, though MCWRA can not graze this easement on private lands. Based upon aerial photos, about one third of the subject area is comprised of grassland and one third is comprised of forests. The density of forestland is greatest in the south and southwest portion of the MCWRA property and the grassland is more prevalent in the north and northeast portion, especially around San Antonio lake.



The rangeland around the two lakes includes numerous native forests comprised of oaks and pines

The final third of the lease area is comprised of lake bottom. The lease areas contain significant land that is below the “high water mark”. Lake levels vary due to river flows upstream of the reservoir as well as water release rates at the two dams. Typically, the lease property boundaries run to the center of the lake, roughly the location of the former riverbeds of the Nacimientto and San Antonio Rivers. Much of this land below the “high water mark” has been subject to significant erosion because of wave action (see related discussion below). As this land erodes, undoubtedly a substantial percentage of this eroded soil is deposited as sediment in the lake bottom. This soil, much of it the former top soil along the edges of the two lakes, is seldom available to support vegetation since it is now deposited below the usual “low water mark.” During the four months that members of the Field Survey Team visited the leases and pasture areas, Nacimientto lake fluctuated over 30 feet. During the same time period, San Antonio lake fluctuated over 15 feet.

Soil conditions vary from deep loams in the lower flatlands to poorly drained shallow clays on some of the steep slopes. The soils analysis conducted by the US-LT RCD and NRCS indicates that the area around the MCWRA’s property varies from good to fair for forage production. In some areas, especially at San Antonio Lake, the best forage production soil is located below “high water mark.” (See Forage Production Map Appendix A-7)



Grazing lands and oak woodlands surrounding Nacimiento Lake

Climate Conditions

The characteristic climate is hot dry summers to cool wet winters. Rainfall varies from over 40 inches in the western highlands to less than 12 inches in the northeast hills. There are cycles of high rainfall and periods of drought, with a slightly higher ratio of drought years and a lower ratio of high rainfall years. (See Precipitation Map Appendix A-5) Since forage, and therefore stocking rates and grazing patterns, will vary significantly from wet to dry years, a static plan for cattle grazing is not advisable.

Wildlife and Aquatic Species

The aquatic species on MCWRA owned land consists of some common as well as rare and endangered species including many types of warm water fish, and amphibians (bull frogs, red-legged frogs, and western pond turtles). There is also abundant wildlife in the watershed such as bald eagles, hawks, mountain lions, turkey vultures, deer, coyote, ground squirrels, and California condor.

During Field Survey Team visits, the Team sighted many of the species in the list above. However, this Plan is not intended to contain an exhaustive list of wildlife or aquatic species. The intent of the Plan is to describe the measures that the authors believe best protects and enhances the habitat for creating and maintaining a diverse ecosystem of both grassland and oak woodland.



Bald Eagles populate the two lakes. This eagle was photographed at San Antonio Lake.



Wildlife at the Lakes include many species of birds

One of the most prevalent species is the common ground squirrel. The ground squirrel population has been increasing substantially over the years. The increase in rodents has resulted in soil erosion, the loss of young oaks, native grasses and other desirable plant species. Good grazing management of the lease sites and grasslands within the recreational properties can help to keep the ground squirrel population in balance. Over population of ground squirrels may impact water quality and erosion as well as result in reductions in oak regeneration. Proper

maintenance of residual dry matter (RDM) has been shown to be a benefit in reducing ground squirrel populations without the use of poisons. (See the section regarding RDM)



Example of erosion caused by squirrel holes

Nacitone Rangeland Leases



SUMMARY OF OBSERVATIONS OF THE FIELD REVIEW

Field visits were conducted by the Field Survey Team during the mid-summer to fall months of 2007. The previous rainy season (2006-2007) was a severe drought, with rainfall amounts less than fifty percent of normal in some areas. The lack of rainfall was one of the factors that the team considered when they conducted the field surveys.

Field Survey Team

The leases and recreational areas owned by MCWRA were part of a field review conducted by staff from the US-LT RCD, Natural Resources Conservation Service (NRCS), MCWRA, San Luis Obispo County Ag Extension Office, and the University of California Cooperative Extension.



Field Survey Team conduct a site visit with a ranch manager

Potential Conflicts of Recreational Use

The two lakes are very popular camping and water sports facilities. During weekends and holidays, many thousands of visitors and neighbors use the lakes for water skiing, wakeboarding, fishing, sun bathing, barbeques, parties, camping and other activities. There are very few restrooms or trash cans available to the public. Some lake users leave behind human waste and trash in and around the edges of the two lakes. Lake users frequently trespass onto MCWRA grazing leases.



Typical day-use by boaters at the lakes. Some boaters trespass into the interior of the lease.

Day use of beach areas around the lake is permitted but, on most grazing sites, there is no provision to permit recreational use (picnicking, trails, restrooms, etc.) on the grazing land. Only Leases 2 and 3 at San Antonio lake contain a contract provision that allows equestrian trails on those grazing areas.



Damage from off-road vehicles causes erosion and loss of vegetation

In addition to lake recreational use, there is a considerable amount of trespassing by persons using off-road vehicles, including trucks, SUVs, motor cycles and quads. There is considerable damage and loss of vegetation due to tire tracks and ruts in the pasture areas. Similar damage is evident in riparian areas adjacent to the lakes.



Primary Impacts of recreational use within grazing lease areas:

- Trash, including broken bottles, cans, paper, etc.
- Human and dog waste
- Illegal camp fires
- Broken fences, resulting in lost or missing livestock
- Vegetation destroyed by trespassing off-road vehicles
- Soil erosion caused by off-road vehicles
- Security issues
- Time and money spent by ranch managers dealing with trespassers and the problem they cause



Trespassers break down fences, allowing livestock to escape and necessitating repairs

Pasture Below “High Water Mark”

As described in General Characteristics, the current leases often run to the bottom of the two lakes. The exposed land below “high water mark” varies from season to season and year to year. The two reservoirs are managed by the MCWRA to reduce seawater intrusion in the lower Salinas Valley, to recharge the Salinas Valley aquifer, and to provide an impoundment for potential flood waters emanating from the two rivers. The Nacimiento River has the highest winter flows within the Salinas River system. Before the dam was constructed, the flows from the Nacimiento River sometimes exceeded the volume of flows from all of the rest of the Salinas River watersheds combined (WAP).

Since the two lakes are managed for multiple purposes, the water surface levels at each of the lakes vary from month to month, often from day to day. On the steeper slopes along lake boundaries, this fluctuation has resulted in the loss of soil. However, on the relatively flat surfaces under the “high water mark” there are sometimes seasonal pasture areas providing green forage late in the season, when the grasses in the upper pasture areas have dried and lost much of their nutrients.



Example of pastureland below “high water mark” after grazing

Woodlands and Understory

The Leases vary from open grassland to dense oak woodland. The woodlands provide less optimal grazing production. However, cattle can be used as a management tool to enhance the condition of the forests while reducing the understory density. In turn, this helps to reduce the potential for hotter forest fires. Hot forest fires cause significantly higher damage to the mature oak trees.

Throughout the United States and in these watersheds, land development and land use intensification has occurred with only limited consideration of natural resource constraints. A noteworthy California example is the mixture of residential and wildlands uses. This has resulted in many homes being built within areas of high fire danger adjacent to the properties owned by the MCWRA. The proximity of homes to the ranches has prevented the use of “prescribed fire” on the rangeland. This adds to a potentially volatile situation on the leases because managed fire cannot be used as a tool to keep underbrush from accumulating on the ranches.



The Leases include many areas of scattered to dense stands of oaks and pines



Oak woodland unmanaged by periodic naturally occurring forest fires

The photo above shows a dense oak woodland where numerous small oak trees compete for sunshine and nutrients. Due to nearby homes, forest fires are extinguished, preventing the natural process of attrition and forest development.

Corrals and Fencing

The condition of existing fencing varies throughout the properties. There are few cross-fences. Perimeter fences and corral fences will require upgrading and repair. The development of cross-fencing, especially within the larger leases, aids the ranch managers in relocating cattle from pasture to pasture, allowing the pastures to regenerate after a short duration of intensive grazing. Water development is necessary when cross-fencing is proposed. This practice is a method of holistic rangeland management (HRM).

The challenges to the development of cross-fencing and the concomitant water development are the cost of implementing and maintaining them. (See discussion regarding “lessee contracts”) Options for addressing the financial challenges to implementing these desirable practices could be considered in the development of “lessee contracts”.



Some of the corral fencing is in need of upgrading and repair

Livestock Water

Currently there are no operating wells and no cattle troughs on the MCWRA leases. Cattle and other animals are dependent upon water from lakes, streams and springs. Cattle spend much of their time in or near streams and the lakes. This results in poor utilization of feed located further from water sources and increases the likelihood that cattle will eat the riparian vegetation along the banks. It also precludes the use of cross-fencing and HRM measures.

On San Antonio lake Lease 2, there is an existing water tank currently being used to supply domestic water for the North Shore Campground. The Monterey County Parks and Recreation Department representative has indicated that this tank may have adequate capacity to provide water for cattle as well as for its current uses. It will require the construction of pipelines and troughs. To achieve similar results on other MCWRA leases, it will require the development of wells, tanks, pipelines and water troughs.

Development of properly distributed wells, water pumped from the lakes, occasional use of water trucks, water tanks and water troughs could significantly change the behavior of the domestic and wild animals around the lakes. These improvements are recommended to be encouraged and supported by the MCWRA. This is believed to be the most beneficial of all management practices suitable for MCWRA leases.



Example of “wildlife friendly” livestock water trough



Example of storage tanks for livestock water troughs



Another example of a water trough

Ecological Site Description

Ecological sites are described in the Appendices (A-10). The following is a Natural Resources Conservation Service (NRCS) uses the following four characteristics as the basis for establishing an area as an “ecological site”.

- Significant differences in the species or species groups that are in the characteristic plant community.
- Significant differences in the relative proportion of species or species groups in the characteristic plant community.
- Soil factors that determine plant production and composition, the hydrology of the site, and the functioning of the ecological processes of the water cycle, mineral cycles, and energy flow.
- Differences in the kind, proportion, and production of the overstory and understory plants due to differences in soil, topography, climate, and environment factors, or the response of vegetation to management.

A description of the ecological site for each of the eight leases within the San Antonio and Naciminto watersheds are expressed through total plant production and production of palatable forage for cattle data. (See the Ecological Site Map in the Appendix A-11) The data for the ecological sites separates the eight leases to illustrate the types of soil, slope, types and percentage of native plant communities, the normal pounds per acre per year of palatable forage and the area that is presented at each of the leases. (See the tables contained in the Appendix regarding Ecological Sites within the study area as well as the tables detailing Nacitone soil and plant production A-19)

Wildlife Habitat

Within the grazing areas the Field Team saw many animal species, including eagles, hawks, deer, foxes and coyotes. There are oaks, pines, and many species of grasses. However, many of the grasses are non-native annual grasses. With the beginning of European settlement in the 1700s, “non-native species were carried to California attached to the hulls of ships, submerged in the ships’ ballast, or carried along in shipments of grain. Today people traveling between natural areas, farms or waterways for work or recreation unintentionally spread invasive species on their vehicles, boats, equipment and even clothing.”¹ As part of this Plan implementation, it is recommended that an effort be made to decrease noxious invasive species and reintroduce more native perennial grasses in order to benefit wildlife species.



The grazing land provides habitat for many wildlife species



Waterfowl at the San Antonio Lake

¹ California Department of Fish Game Home Page. Non-Native Invasive Species. 18 Apr. 2008.
<http://www.dfg.ca.gov/invasives/>.

Forage Production and Condition of Existing Residual Dry Matter – RDM

According to the Society of Range Management forage productivity consists of:

- Forage: Browse and herbage which is available and may provide food for grazing animals or may be harvested for feeding.
- Forage production: The weight of forage that is produced within a designated period of time on a given area. The weight may be expressed as either green, air-dry, or oven-dry. The term may also be modified as to time of production such as annual, current years, or seasonal forage production.
- Forage allocation: The planning process or act of apportioning available forage among various kinds of animals, e.g., elk and cattle.
- Forage inventory: An estimate of available forage in each pasture and for the operating unit as a whole; used to project stocking rates and feed requirements for specific time periods (i.e., annually, grazing season, rotation cycle, etc.).
- Forage reserves: Standing forage specifically maintained for future or emergency use.

One of the field conditions that the Survey Team and research staff considered was the amount of residual dry matter (RDM). According to UC Cooperative Extension, RDM “is a standard used by land management agencies and grazing managers for assessing the level of grazing use on annual rangelands. RDM is the old plant material left standing or on the ground at the beginning of a new growing season.”² RDM provides one measure of the degree of success of good grazing management and shows the effects of the previous season’s forage production and its consumption by farm and wild grazing animal species.

Good RDM produces multiple benefits including reduced soil erosion, improved grass regeneration and wildflower regeneration. It also assists in keeping the ground squirrel population in check. The following are several photos taken during the Field Team site visits showing examples of the existing conditions observed at the Lease properties.

² UC Cooperative Extension. 6 August 2008. Guidelines for Residual Dry Matter on Coastal and Foothill Rangelands in California. <http://ucanr.org/repository/fileaccess.cfm?article=54159&p=%20FPKIPN>.



Example of too little RDM less than 100 pounds per acre



Example of good RDM over 500 pounds per acre



Example of good RDM

A proper level of RDM remaining in the fall provides protection against early season rainstorm runoff and influences subsequent plant species composition and forage production. “Properly managed RDM can be expected to provide a high degree of protection from soil erosion and nutrient losses. Applications of specific RDM standards based on a limited research base and experience have demonstrated the effectiveness of this approach to grazing management.”³

Good RDM helps in the regeneration of next season grasses by providing protection for seed germination and retaining soil moisture. Too little RDM results in exposed soil and increases raindrop impact on the soil, causing sheet erosion and increased runoff. It is recommended that RDM be one of the primary indicators of good ranch managing techniques.

Excessive RDM can be as harmful to the health of the grassland as too little RDM. Excessive RDM results in poor plant regeneration because the seedlings do not get the sunlight necessary for growth. It can also lead to high grass fire potential during the summer and fall. The grassland areas of the recreation areas are recommended for inclusion in the grazing and land management component of this Plan.

³ UC Cooperative Extension. 6 August 2008. Guidelines for Residual Dry Matter on Coastal and Foothill Rangelands in California. <http://ucanr.org/repository/fileaccess.cfm?article=54159&p=%20FPKIPN>.



This photo shows an example of excessive RDM in the area adjacent to the San Antonio Lake South Shore park entrance. Note that much of the vegetation in this photo is non native thistle, an extremely prolific and noxious weed. This site is part of the area operated by the County Parks Department. Occasional grazing of this pasture could provide a benefit to improve the health of this section and reduce noxious weeds.

Due to the limitation of time, we did not visually survey the entire 16,000 acres. The grazing land that we did observe ranged from good RDM, ranging from approximately 500 to 800 pounds per acre for this area, to some areas of less than 100 pounds per acre. A principal cause of the lack of RDM in some areas was the 2006-2007 drought. The primary ranch management goal should be to increase the RDM to levels of 500 pounds or higher RDM. The RCD/NRCS will provide ranch managers assistance in accomplishing this goal. However, there will always be fluctuations due to climatic conditions, slope aspect, soil type, and other factors. It is recommended that the following RDM table from the University of California, be used as the guideline for assessing the adequacy of RDM on a ranch site.

Table 1. Minimum RDM standards for annual grassland/hardwood rangeland in pounds per acre (dry weight)

Wood cover (%)	RDM standard for percent slope (lb/acre)			
	0-10	10-20	20-40	>40
0-25	500	600	700	800
25-50	400	500	600	700
50-75	200	300	400	500
75-100	100	200	250	300

Note: Metric conversion: 1 lb/ac = 1.12 kg/ha.

Soil Erosion

Sheet Erosion: Sheet erosion is the uniform removal of soil in thin layers by the forces of raindrops and overland flow. It can be a very effective erosive process because it can cover large areas of sloping land and go unnoticed for quite some time.

Sheet erosion can be recognized by either soil deposition at the bottom of a slope, or by the presence of light - colored subsoil appearing on the surface. If left unattended, sheet erosion will gradually remove the nutrients and organic matter which are important to agriculture and eventually lead to unproductive soil.

<http://topsoil.nserl.purdue.edu/nserlweb/weppmain/overview/sheet.html>

Sheet erosion is difficult to discern on open grasslands. Significant sheet erosion was not evident in the areas evaluated during field visits.

Rill Erosion: Rill erosion is the removal of soil by concentrated water running through little streamlets, or headcuts. Detachment in a rill occurs if the sediment in the flow is below the amount the load can transport and if the flow exceeds the soil's resistance to detachment. As detachment continues or flow increases, rills will become wider and deeper.

<http://topsoil.nserl.purdue.edu/nserlweb/weppmain/overview/rill.html>

Significant rill erosion was not evident on the Lease properties.

Gullies: Classical gullies are an advanced stage of channel erosion. They are formed when channel development has progressed to the point where the gully is too wide and too deep to be tilled across. These channels carry large amounts of water after rains and deposit eroded material at the foot of the gully. They disfigure landscape and make land unfit for growing crops.

<http://topsoil.nserl.purdue.edu/nserlweb/weppmain/overview/gullies.html>

There are numerous eroding gullies on the lease properties. They range from small channels that can be easily remedied, to very large gullies that necessitate major corrective action. The majority of the gullies have been caused by road drainage and storm water culverts. The largest gullies were observed along the Tank Road paralleling the north side of San Antonio Lake. Some of these gullies are over 20 feet deep and 30 feet wide. (See discussion below on road caused erosion)

Stream Channel Erosion: Erosion in channels is mostly caused by downward scour due to flow shear stress. Side wall sluffing can also occur during widening of the channel caused by large flows.

<http://topsoil.nserl.purdue.edu/nserlweb/weppmain/overview/channel.html>

Some of the stream channels that we reviewed had moderate-to-severe bank and bed erosion. A significant reason for the erosion is the lack of riparian vegetation. It is anticipated that implementation of the recommended grazing methods as well as the provision of water for the cattle away from water bodies will result in restoration of riparian vegetation with a subsequent reduction in channel erosion.



Bank erosion on seasonal creek

Wave Caused Erosion: The extent of soil erosion from wave action depends greatly on the bank slope, vegetation, and bank composition. Natural beaches serve as buffers for the bank and absorb some of the wave action before it hits the bank. Soil erosion caused by wave action commonly occurs during high water, when beaches are completely submerged in water and the bank is exposed.

http://www.nrpcvt.com/nrpcvt/shoreline_files/shorelinessection2.pdf

The most significant erosion on the lease properties is occurring between the “high water mark” and the “low water mark.” It did not appear that cattle grazing was a major cause of erosion below “high water mark.” This erosion appears to be caused by several interrelated factors: wave action on the lake surface (caused by wind and boat wake) and the constantly changing lake levels resulting in numerous “steps” of erosion along the banks. This wave caused erosion was documented during site visits.

In some areas along the shore of Nacimiento Lake, the topsoil has eroded to the underlying rock. This erosion below “high water mark” varies from a few inches to over 6 feet of soil loss as can be seen in the photo below. While this erosion is occurring at both lakes, the greatest amount is along the Nacimiento lakeshore. During the late fall 2007 field visits, the exposed lake shore was approximately 70 feet below the “high water mark.” Most of the sloping portion of the lease

properties below “high water mark” showed signs of significant erosion. For this reason, much of the land below the “high water mark” does not have sufficient soil to support vegetation.



Step like soil erosion below “high water mark.” Erosion at right side is in excess of 6 feet in depth.



‘Step-like’ soil erosion of lease properties below “high water mark”



Close-up photo of soil erosion below "high water mark" along the lake bank

Road Caused Erosion:

Ranch Roads: There are numerous dirt roads providing access for the ranch managers to cattle, fences, and corrals. Some of these dirt roads exhibit drainage and erosion problems. Some have been poorly graded, many are in need of maintenance, and some need upgrading of drainage facilities such as new culverts and rock energy dissipaters. There is a need to create financial incentives to upgrade and maintain ranch roads.



Drainage from ranch roads has caused soil erosion



Ranch roads in draws, ravines, and valleys can become a conduit for storm flow, accelerating and concentrating flows that cause soil erosion and gullies



Ranch roads that are "out-sloped" are less likely to cause concentrated flows or soil erosion

Public/Semi Public Roads

Some of the roads on the grazing land are public/semi public (County maintained / privately maintained) and provide access to residential developments, recreation areas and other properties. Most are asphalt paved roads but some are dirt roads. As with ranch roads, these public/semi public roads are in need of better drainage facilities and correction of erosion problems.



Privately maintained road through Nacimiento lease 3, used by neighbors to access residential properties for recreational uses

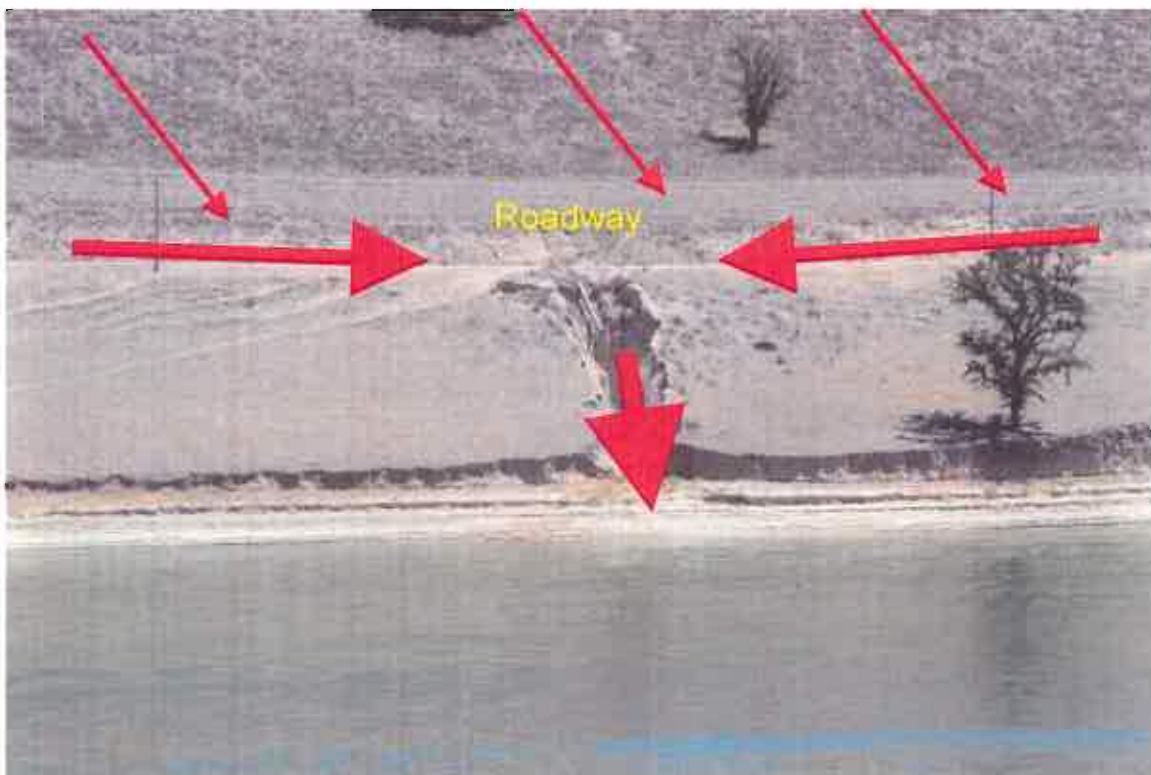
Tank Road

The most severe road drainage erosion observed by the Field Team, on the lease properties, is the result of poor drainage facilities and poor design of the "Tank Road," also known as the "Tank Trail", a long dirt road that parallels the north side of San Antonio Lake. The Tank Road provides access for military vehicles to travel between Fort Hunter Liggett and Camp Roberts. The road was apparently constructed in the 1960's to replace an older road that was flooded when the reservoir was constructed. It is a dirt road varying in width from approximately 25 to 40 feet. The worst erosion problems occur on Lease #3.

While the erosion is severe, it is correctable if the grading and drainage is corrected. The erosion causes should be assessed and corrected.



Road drainage is second greatest cause of erosion on the lease properties



The Tank Road on Lease #3 along the north side of San Antonio Lake concentrates drainage to an undersized inlet and culvert. The gully was formed when storm flows overwhelmed the culvert and no channel was provided for the excessive flow.



The Tank Road collects the drainage from the entire mountainside and redirects it to the undersized culvert shown in the following photo



This culvert pipe along the tank road is undersized and the inlet is blocked with debris



View of erosion and exposed culvert pipe



Undersized culverts, blockages by debris and poor road drainage are causes of erosion



Another large eroded gully caused by poor road design and inadequate storm drainage system

Lessee Contract Limitations

Currently, the MCWRA lessee contract procedures for the eight rangeland leases are limited to three years. The current leases were awarded through a request for proposal procedure; previous leases were awarded through an open bid process. Previous lease contracts had provisions that were limited to 20% of the lease payments that could be credited for improvements made on the lease properties. In order to enhance the likelihood that lessees would implement BMPs, the current lease contracts allow up to 50% of lease payment for improvements that create new water systems or riparian fencing. The new contract provisions should be monitored to determine their impact or adequacy for encouraging better range management and adjustments should be made where deemed necessary by the MCWRA to implement the strategies identified in this Plan.

GRAZING LANDS AG WATER QUALITY SHORT COURSES

To provide exposure to the management techniques discussed in this Plan, a Ranch Water Quality Planning Short Course was offered by the UC Cooperative Extension in partnership with MCWRA, US-LT RCD, SLO County Ag Extension and the USDA NRCS to lease ranch managers and other area ranchers. In November 2007, the US-LT RCD and MCWRA sponsored and coordinated a four-day Short Course was conducted for the ranch managers with a special emphasis on grazing management in the Lake Nacimiento and Lake San Antonio watersheds. The primary objective of the course was to educate land managers about non-point source pollution and water quality planning on grazing lands.

The agenda during the four day Short Course included presentations from representatives of the following agencies, organizations and universities:

- Monterey County Water Resources Agency (Ken Ekelund)
- Upper Salinas-Las Tablas Resource Conservation District (Chuck Pritchard, DJ Funk, Chris Robinson)
- University of California Cooperative Extension (Royce Larsen, Wayne Jensen)
- Natural Resources Conservation Service (Karl Striby, Danny Marquis)
- Farm Bureau (Kay Mercer, Traci Roberts)
- Regional Water Quality Control Board (Larry Harlan)
- Cal Poly University (Rob Rutherford, Brent Hallock)
- UC Santa Cruz (Marc Los Huertos)
- UC Davis (Mel George)
- Assistance with the Short Course was also provided by:
 - US-LT RCD (Marti Johnson)
 - County of San Luis Obispo Extension Office (Amy Breschini)

The first three days of the Short Course consisted of classroom education about non-point source pollution, water quality concerns and regulations, and best management practices to improve water quality runoff from grazing lands. The fourth day of the Short Course was a field tour during which participants gained firsthand experience in measuring residual dry matter, assessing roads and taking water quality samples as components of voluntary self-monitoring to improve land management. Many presentations provided referral information to technical service providers and cost-share programs available to assist land managers with ranch water quality planning. All participants received a binder of educational materials including the Water Quality Plan template, fact sheets, monitoring information, guidance on how to start a Watershed Working Group, soils information and other reference materials.

The November 2007 Short Course was attended by twenty participants. In addition, a videographer was hired to record and edit the Short Course to make it widely available on DVD

for land managers unable to attend in person. The course provided good information for the use of the Lessee's ranch managers as well as for owners of other ranches within the region. It is recommended that future ranch water quality short courses be conducted on a regular basis.



The Short Course included both classroom and field training



Brent Hallock, Cal Poly Professor, shows ranch managers and land owners a methodology for assessing percentage of vegetative ground coverage



Forest lands and recreational areas near Nacimiento dam

MANAGEMENT STRATEGIES

Disclaimer: The following recommendations represent the opinion of the RCD and may not reflect current MCWRA policy. Before any of these recommendations are enacted by MCWRA, changes to policy will be reviewed through regular MCWRA procedures and approved as required by their Board of Directors and/or Board of Supervisors. While many of these recommendations are directed towards MCWRA lands, many could be applied to ranches throughout these watersheds.

To enhance the likelihood that specific goals and objectives of MCWRA and current ranch managers will be met, a number of strategies have been developed. It should be remembered that these strategies will need to be adapted to each area and will likely vary from one lease property to another. Also, this Plan is a "living document" and the management strategies should be reassessed regularly as conditions and land uses change.

1. MCWRA should seek additional funding sources to assist in the implementation of the recommendations listed in this land management study. Through the NRCS and the RCD, the MCWRA and lessees should seek financial assistance from Farm Bill programs such as Environmental Quality Incentives Program (EQIP) to implement rangeland improvements.
2. Ranch managers should monitor their grazing leases on a continuing basis to ensure that grazing lands and facilities are in good order and that the natural resources are conserved.



RCD, NRCS and UC Cooperative Extension should meet with MCWRA
and ranch managers to evaluate changing conditions

3. MCWRA should consider using a suite of rangeland monitoring methods that could include water quality testing, RDM, plant surveys and other methods that will lead to better management practices to preserve and enhance the water quality of the reservoirs and watersheds as a whole. These should be developed in cooperation with RCD, NRCS, UC Cooperative Extension, county AG commissions, and livestock and rangeland associations.
4. In order to evaluate effectiveness of the prescribed management strategies on leased land, it is recommended that the RDM is monitored each fall. A methodology for monitoring should be established by MCWRA in cooperation with the US-LT RCD and NRCS. Agriculture students may be requested to assist these agencies in providing this assessment where deemed appropriate. The goal for each of the leases is to maintain a minimum average of RDM corresponding to Table 1 page 24. Seasonal variations and rainfall should be considered in the RDM evaluation.
5. MCWRA lessees and staff should seek guidance from the RCD/NRCS range specialists for measuring success and adjusting to changing conditions such as climate changes, infestations of noxious species, wildfires, and other conditions. Since there are so many variables concerning the lease properties, it is recommended that the lessee grazing managers have flexibility to determine the best measures to maintain proper levels of RDM on each lease.

6. Annually, the RCD and NRCS should assist MCWRA and the lessee's ranch managers in establishing management techniques for grazing that are specific to each Lease, including the rangeland used for Recreation Areas. The adopted management techniques will consider the yearly fluctuations in weather conditions and the objectives for fire management and habitat enhancement dictated by existing conditions.
7. Management measures that maintain a good balance within the ecosystem should be encouraged. Where there is an imbalance, as currently exhibited in the excessive number of ground squirrels in some areas, it is recommended that proper levels of RDM and the encouragement of natural predators be practiced. Poisons are not recommended as a control measure for rodents.
8. MCWRA should continue to provide and develop additional resources that provide substantial financial incentives to implement measures to best manage grazing animals so that adequate RDM is maintained and animals are discouraged from frequenting riparian and lake areas:
 - a) Install alternative water systems serving cattle including the construction of wells (and connections to pump lake water where wells are not feasible), providing power for the pumps, installing water storage tanks, constructing water pipelines and installing wildlife friendly troughs (to include wildlife escapes and float valves) in areas away from the edge of the lakes.
 - b) Monitor the effectiveness of the use of water troughs to draw cattle away from the lakes and streams. If, after a period of time, the cattle have not changed their behavior, and continue to frequent the lake, implementation of riparian fencing and other alternatives should be evaluated by MCWRA, lessees and the RCD.
 - c) Install new cross-fences to improve grazing distribution and to provide a management tool for the lessee's grazing managers.
 - d) Assist the lessees in providing safe (boater friendly fencing) ways to fence at and near the lake edge.
 - e) Encourage other measures that help the lessee's ranch managers meet the objectives of this Plan.
9. Establish a program with the lessees and RCD to plant native perennial grasses and other native vegetation where feasible. Management measures that help to conserve wildlife should be encouraged.

10. Consider managing the lease areas as a single unit, or possibly consolidate into as few units as are logical. This should also include land that is owned by MCWRA but not currently under a grazing lease. Some possible options include creating:
 - a) One unit on north side of San Antonio lake (Current Leases 2 and 3)
 - b) One unit on south side of San Antonio lake (Current Leases 1 and 4)
 - c) One unit on north side of Nacimiento lake (Current Leases 1 and 5)
 - d) One unit on south side of Nacimiento lake (Current Leases 2 and 3)
11. Develop specific conservation objectives for each lease in contrast to the current approach, which only lists overall MCWRA conservation objectives that are applied to all leases. Create an overall set of conservation goals which apply to all MCWRA land that protects water quality and quantity, reduces fire danger and liability, maintains sufficient RDM and encourages wildlife habitat protection. MCWRA, with the assistance of the RCD, NRCS and other agencies, should regularly monitor success in attaining these goals. MCWRA should assess the language and terms of the leases in relation to the goals and objectives of this Plan.
12. Prepare and implement with assistance from CAL Fire and the local fire districts an integrated fire plan that addresses the use of managed fires and grazing to reduce the vegetative understory and the potential for hotter, more destructive wildland fires.
13. MCWRA should review options to discourage trespassing, damage caused by off-road vehicles, and litter on MCWRA land and in environmentally sensitive areas. One potential measure that may be considered is the construction of public walking and horse trails. These trails could provide a degree of informal observance within remote areas of the lease properties. The compatibility and feasibility of these trails should include the input and consideration of the lessees.
14. Consider implementing a program to address oak forest and underbrush management with assistance from the UC Cooperative Extension, RCD and NRCS.
15. Consider ways to provide additional restroom facilities with trash containers (possibly on grazing leases) to decrease waste in lakes and on grazing leases.
16. MCWRA and RCD should coordinate a plan to graze grassland areas in MCWRA recreational areas at the two lakes which are not currently under a grazing lease.

17. Continue to have periodic Ranch Water Quality Short Courses for staff, ranch managers, lessees and neighboring private land owners.
18. Consideration should be given to leases for periods longer than three years in order to provide a more consistent management implementation and eligibility for outside funding sources such as EQIP grants.
19. Consider creating a Grazing Advisory Committee made up of members of the ranching community, the lessees, RCD, NRCS and UC Cooperative Extension that would meet periodically to advise MCWRA on their grazing program.
20. Create a cooperative partnership between MCWRA and lessees with periodic assistance from the RCD, NRCS and UC Cooperative Extension regarding erosion and resource conservation. There are many ways to achieve the objectives listed in this study including implementing short duration, high intensity grazing practices. This practice is more difficult to implement on small ranches, such as those owned by the MCWRA. For this reason, good management will require the partnership and cooperation.
21. There are many ways to achieve the objectives listed in this study including implementing short duration, high intensity grazing practices. This practice is more difficult to implement on small ranches, such as those owned by MCWRA. For this reason, good management will require partnership and cooperation.
22. MCWRA should encourage the Counties of San Luis Obispo and Monterey to consider modifying their planning priorities to limit the development around the two lakes for the lands outside of the developed communities of Heritage Ranch and Oak Shores. MCWRA should work with groups to purchase conservation easements and work with neighboring properties owners to reduce impacts of new development in proximity to MCWRA lands around the reservoirs.
23. MCWRA staff and lessees should work with RCD engineers and erosion control specialists to correct road drainage along the ranch roads and other roads that cross MCWRA land. Existing roads should be evaluated by an erosion control specialist to determine measures that can be taken to reduce road-caused erosion. Pursuant to the San Luis Obispo County Erosion Control Handbook, "The Cover Up Story," four basic principles should be followed in the grading and construction of new ranch roads: 1 minimize the amount of disturbance by controlling the length of roads and reducing the

area of disturbance along the road; 2 avoid road construction in high erosion hazard areas; 3 minimize erosion by using proper erosion control practices (see below); and 4 minimize off-site (out of the road right-of-way) impacts.

Guidelines for the erosion and sediment control practices:

1. Avoid high erosion hazard sites.
2. Reduce the area of road disturbance by taking advantage of landforms such as benches, ridges and flatter slopes.
3. Use short segments of steeper grade roads to avoid problem areas or to take advantage of landform.
4. Avoid locations on long, steep, unstable slopes.
5. Locate roads on well-drained soils and rock formations.
6. Avoid slide-prone areas such as seeps, clay beds, and concave slopes.
7. Avoid undercutting unstable toe slopes when near valley bottoms.
8. Reduce concentrated flow in drainage ditches and on road surfaces by using techniques such as out-sloping roads and rolling-dips where practical.
9. Select drainage crossings to reduce channel disturbance and cuts and fills.
10. Culvert crossings should be properly sized and installed.

It is recommended that documents such as the SLO County "Cover Up Story" design and construction criteria or Mendocino County RCD's Handbook for Forest and Ranch Roads be used as a general guide in the regards to old ranch roads and in the construction of all new ranch roads and drainage culverts. (Refer to the SLO Erosion Control Handbook, "Cover Up Story, 2005 edition or Mendocino County RCD's Handbook for Forest and Ranch Roads, 1994 edition).

24. MCWRA should partner with the RCD and the military to cooperate on the evaluation, design and implementation of a program to correct the drainage and erosion problems along the Tank Road.
25. MCWRA with RCD assistance should establish programs to correct erosion along stream channels on their land.
26. MCWRA should evaluate options to reduce the wave caused erosion occurring on MCWRA property around the two lakes.
27. Conduct continual outreach and education for the persons who live or visit the lakes to improve their knowledge and commitment to methods for maintaining good conditions on the grasslands, forests and lakes.

28. MCWRA should consider distributing materials to educate boaters and park visitors about the role of cattle grazing in land management and provide guidelines for visitor safety around cattle.



Nacimiento River

ACKNOWLEDGEMENTS

This Grasslands and Woodlands Management Plan would not have been possible without the help of the staff of the Monterey County Water Resources Agency (MCWRA), the staff of the Monterey County Parks Department (MCPD), the land lessee ranch managers, University of California Cooperative Extension (UC Coop Ext), the USDA Natural Resources Conservation Service (NRCS) and many others who helped with ideas that have been incorporated into this plan. Their input will enhance the conservation of biodiversity and the management of the grasslands and aquatic systems of the properties owned by MCWRA.



Nacimiento River

Data Collection, Field Work, Analysis and Document Preparation

Special thanks go to the following individuals for helping with the field trips, meetings, data preparation, analysis, writing, and editing:

Ken Ekelund, MCWRA
Karl Striby, NRCS
Amy Breschini, SLO Ag Ext
Chuck Pritchard, US-LT RCD
Marti Johnson, US-LT RCD
Shayna Bailey, US-LT RCD

Royce Larsen, UC Coop Ext
Ken Oster, NRCS
Chris Robinson, US-LT RCD
Danny Marquis, NRCS
Breanne Ventura, US-LT RCD

Grazing Land Ag Water Quality Short Course

Thanks also go to the following individuals for helping conduct the very successful Ranchlands Ag Water Quality Short Course during fall 2007 at San Antonio Lake:

Ken Ekelund, MCWRA
Karl Striby, NRCS
Amy Breschini, SLO Ag Ext
Chuck Pritchard, US-LT RCD
Larry Harlan, RWQCB
Kay Mercer, SB Farm Bureau
Brent Hallock, Cal Poly
Wayne Jensen, UCCE

Royce Larsen, UC Coop Ext
DJ Funk, US-LT RCD
Chris Robinson, US-LT RCD
Marti Johnson, US-LT RCD
Danny Marquis, NRCS
Tracy Roberts, SB Farm Bureau
Marc Los Huertos, UC Santa Cruz
Mel George, UC Davis

APPENDIX A:
ECOLOGICAL MAP AND TABLE SITE DESCRIPTIONS

NACITONE RANGELAND LEASES SOILS MAP

Soils Map Summary:

The maps contained within the appendices (soils map) were developed by soil scientists who performed surveys to determine existing soil types within San Luis Obispo County. The Field Survey Team used these soil surveys conducted by soil scientists for the areas at Lake Nacimiento and Lake San Antonio. These soil surveys not only provide the soil types at a specific location, but they also provide steepness, length and shape of slopes, the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils.

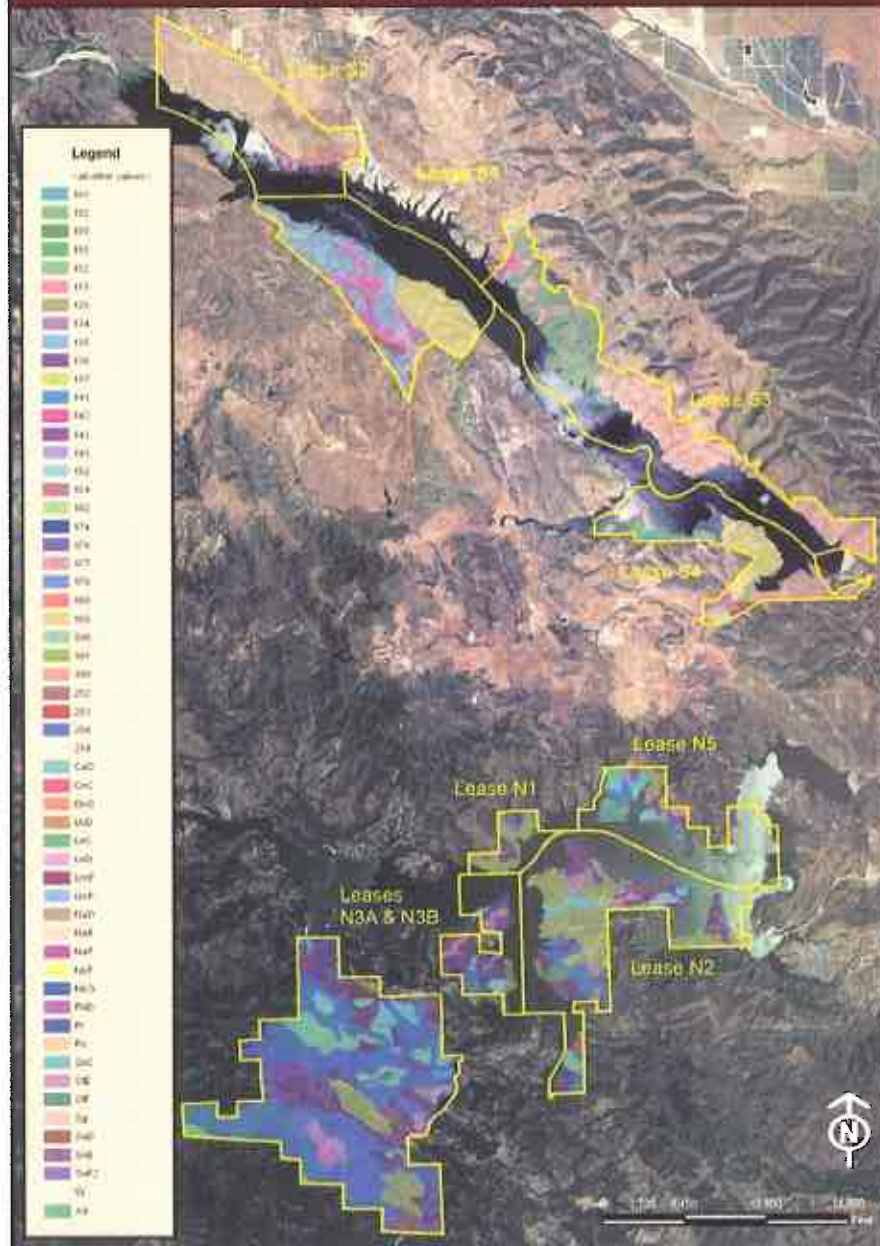
Within the properties owned by the MCWRA, there are 56 different soil types. In the two counties of San Luis Obispo and Monterey, there are over 300 different soil types. This exceeds the total types of soils in the entire State of Kansas.

As a way to survey sites, soil scientists conduct field subsurface sampling and record the sequence of natural layers or horizons, in a soil profile that extends from the surface down into the parent material. After the soil profile characteristics have been recorded and compared with distant and neighboring counties, a nationwide uniform soil classification procedure can then be developed.

Once a guide for classifying and naming the soils has been established, the soil scientists were then able to draw the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads and other details that help in accurately drawing boundaries.

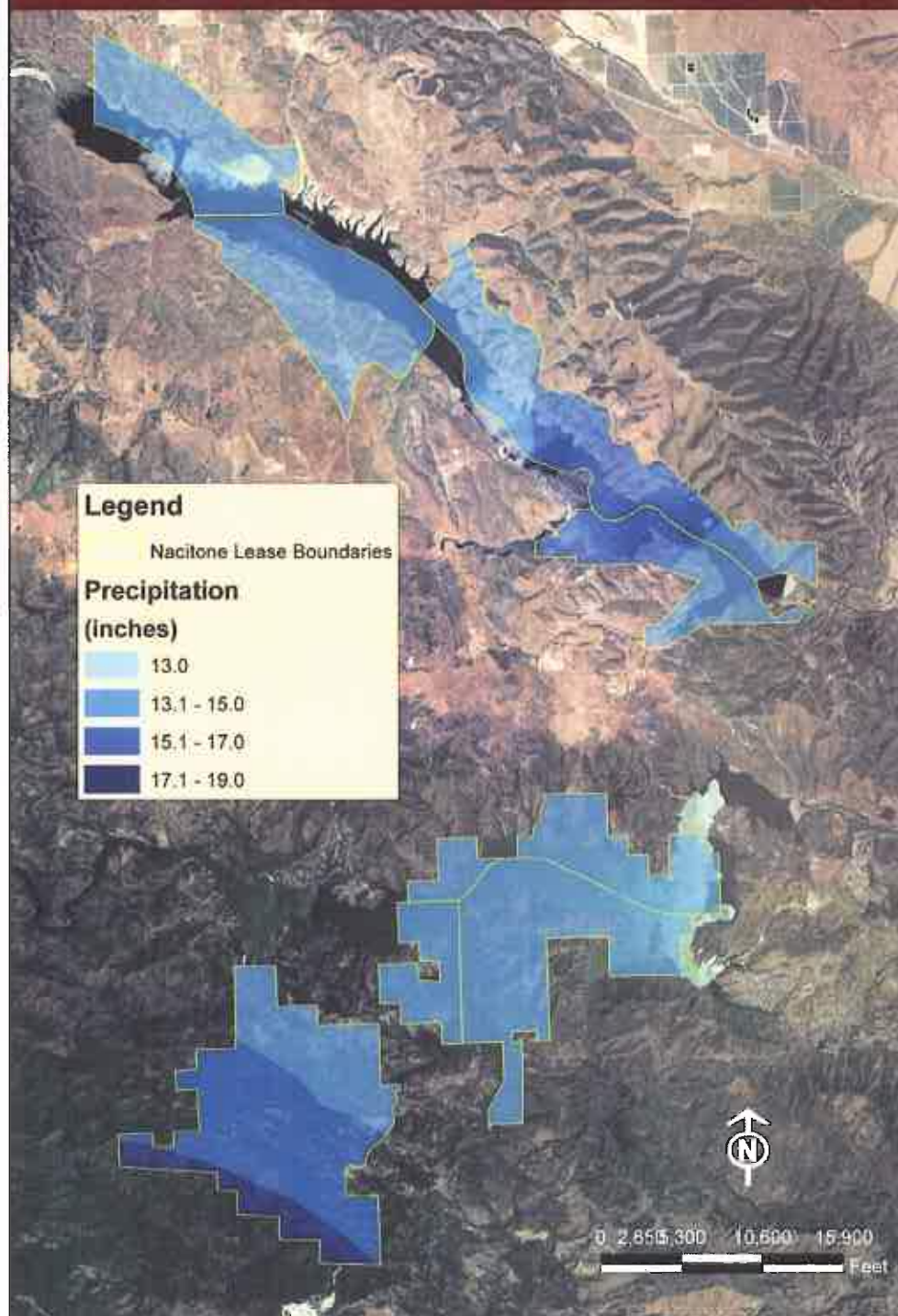
Please refer to Soil Survey of San Luis Obispo County, California, Paso Robles Area (USDA Natural Resources Conservation Service, digital version January 4, 2007), and the Soil Survey of Monterey County, California (USDA, Natural Resources Conservation Service, digital version April 23, 2007) for a detailed description.

Nacitone Rangeland Leases Soils Map



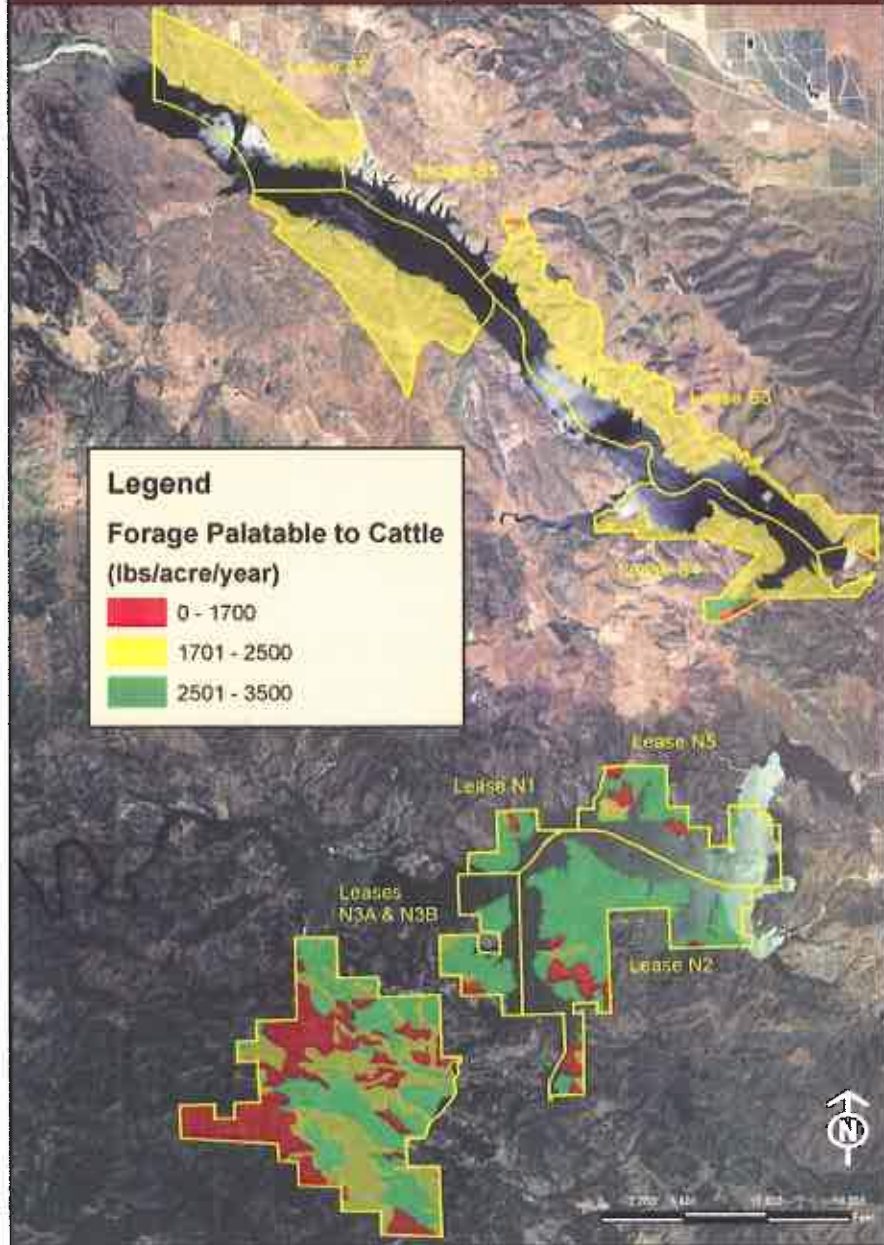
NACITONE RANGELAND LEASES PRECIPITATION MAP

Nacitone Rangeland Leases Precipitation Map



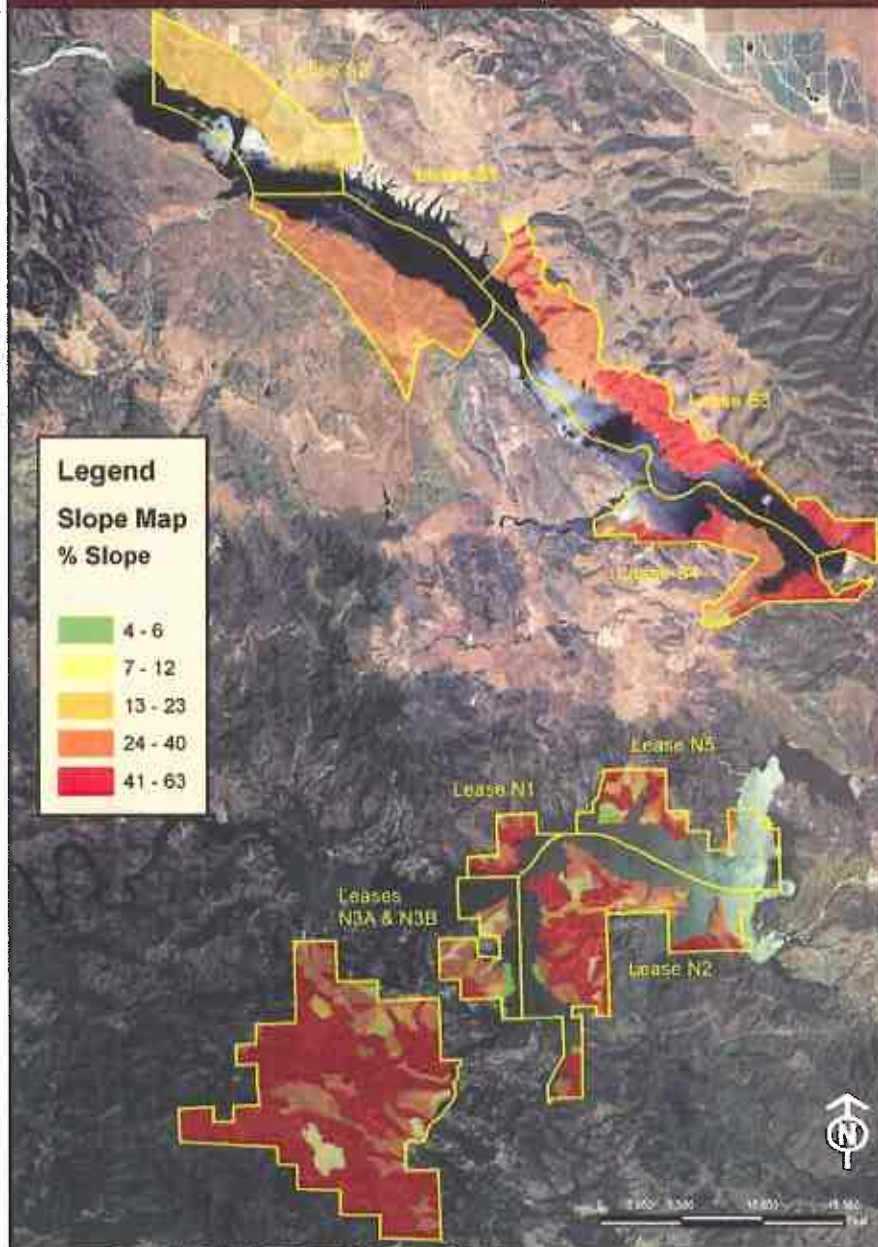
**NACITONE RANGELAND LEASES PRODUCTION OF FORAGE PALATABLE TO
CATTLE (Please see discussion on page 25)**

Nacitone Rangeland Leases Production of Forage Palatable to Cattle



NACITONE RANGELAND LEASES SLOPE MAP

Nacitone Rangeland Leases Slope Map



NACITONE RANGELAND LEASES ECOLOGICAL SITE MAP

Ecological Site Map and Soil and Plant Production Table Description:

The ecological site map identifies the type of soil as well as the type of plant community and production an area supports. The plant production table in combination with the ecological site map for both Lake San Antonio and Lake Nacimiento shows the different types of soil, the name of the ecological site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the expected percentage of each species in the composition of the potential natural plant community.

An *Ecological site* is defined as “a distinctive kind of land with specific characteristics that differs from other kinds of land in its ability to produce a distinctive kind and amount of vegetation”. Any land inventory, analysis, and resulting management decisions require the knowledge of these individual sites and their interrelationships to one another on the landscape. The ecological site description is the document that will contain information about the individual ecological sites.

Dry weight refers to the total air-dry vegetation produced per acre each year by the potential natural plant community. Vegetation that is highly palatable to livestock and vegetation that is unpalatable are included. Some of the vegetation can also be grazed extensively.

Characteristic vegetation—the grasses, grasslike plants, forbs and shrubs that make up most of the potential natural plant community on each soil—are listed by common name. Under composition, the expected proportion of each species is presented as the percentage, in air-dry weight, of the total annual production. This includes the current year’s growth of leaves, twigs, and fruits of woody plants. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season. Generally all of the vegetation produced is not used.

For a detailed description please refer to Soil Survey of San Luis Obispo County, California, Paso Robles Area, USDA Soil Conservation Service printed May 1983), pages 77 and 78, Soil Survey of Monterey County, California (USDA Soil Conservation Service, printed April 1978) pages 108 through 114, and the NRCS Ecological Site Information system at <http://esis.sc.egov.usda.gov/ESIS/About.aspx>.

Nacitone Rangeland Leases Ecological Site Name Map



**NACITONE SOIL AND PLANT PRODUCTION TABLE BY LEASE,
SAN ANTONIO LAKE**

Nacitone Soil and Plant Production Data by Lease, San Antonio Lake

Lease	Soil Map Unit Symbol	% Slope (avg)	Ecological Site Name	Total Plant Prod (NI Yr) (lbs/ac/yr)	Forage Palatable to Cattle (NI Yr) (lbs/ac/yr)	Area (ac)	(%)	Total Production for Lease (lbs/ac/yr)
S1	CnC	6	Clayey	2,300	2,300	4	0.2	9,200
	DbD	12	Clayey	2,300	2,300	2	0.1	4,600
	LmE	23	Fine Loamy	2,150	2,150	44	2.1	94,600
	LmF	40	Fine Loamy	2,150	2,150	559	26.6	1,201,850
	NaE	23	Clayey	2,300	2,300	16	0.8	36,800
	NaF	40	Clayey	2,300	2,300	199	9.5	457,700
	NbF	40	Clayey	2,300	2,300	383	18.2	880,900
	SnE	23	Clayey	2,300	2,300	33	1.6	75,900
	SnF2	40	Clayey	2,300	2,300	54	2.6	124,200
	W	0	Water	0	0	806	38.4	0
	Total Palatable Production for Lease S1 (lbs/year)				2,885,750	2,100	100.0	2,885,750
S2	CnC	6	Clayey	2,300	2,300	2	0.1	4,600
	LbD	12	Clayey	2,300	2,300	30	1.7	69,000
	LeC	6	Fine Loamy	2,150	2,150	2	0.1	4,300
	LeD	12	Fine Loamy	2,150	2,150	18	1.0	38,700
	LmE	23	Fine Loamy	2,150	2,150	167	9.6	359,050
	NaD	12	Clayey	2,300	2,300	150	8.6	345,000
	NaE	23	Clayey	2,300	2,300	799	46.0	1,837,700
	PnD	12	Claypan	1,950	1,950	2	0.1	3,900
	SbC	6	Loamy	2,000	2,000	6	0.3	12,000
	SnD	12	Clayey	2,300	2,300	3	0.2	6,900
	W	0	Water	0	0	557	32.1	0
	Total Palatable Production for Lease S2 (lbs/year)				2,681,150	1,736	100.0	2,681,150
S3	CaD	12	Terrace	1,400	1,400	14	0.5	19,600
	LeD	12	Fine Loamy	2,150	2,150	7	0.3	15,050
	NaE	23	Clayey	2,300	2,300	1	0.0	2,300
	NaF	40	Clayey	2,300	2,300	40	1.5	92,000
	Pr	3	Sandy	1,400	1,120	0	0.0	0
	Rc	53	Shallow Coarse Loamy	800	680	10	0.4	6,800
	SfF	40	Loamy	2,000	2,000	586	21.7	1,172,000
	Sg	53	Loamy	2,000	2,000	954	35.3	1,908,000
	W	0	Water	0	0	1,087	40.3	0
	Total Palatable Production for Lease S3 (lbs/year)				3,215,750	2,699	100.0	3,215,750
S4	110	23	Clayey	2,900	2,900	6	0.4	17,400
	152	20	Shallow Fine Loamy	1,400	910	11	0.8	10,010
	154	63	Gravelly Fine Loamy	1,700	1,700	15	1.1	25,500
	176	40	Fine Loamy	2,900	2,900	24	1.8	69,600
	180	40	Fine Loamy	2,900	2,900	15	1.1	43,500
	188	6	Fine Loamy Bottom	3,500	3,500	19	1.4	66,500
	199	63	Gravelly Fine Loamy	1,700	1,700	2	0.1	3,400
	LeC	6	Fine Loamy	2,150	2,150	0	0.0	235,910
	NaF	40	Clayey	2,300	2,300	10	0.7	23,000
	NbF	40	Clayey	2,300	2,300	277	20.7	637,100
	NbG	63	Clayey	2,300	2,300	51	3.8	117,300
	SfE	23	Loamy	2,000	2,000	21	1.6	42,000
	SfF	40	Loamy	2,000	2,000	35	2.6	70,000
	Sg	53	Loamy	2,000	2,000	185	13.8	370,000
	Xd	58	Loamy	2,000	2,000	90	6.7	180,000
	W	0	Water	0	0	577	43.1	0
	Total Palatable Production for Lease S4 (lbs/year)				1,911,220	1,338	100.0	1,911,220

**NACITONE SOIL AND PLANT PRODUCTION TABLE BY LEASE,
NACIMIENTO LAKE**

Nactione Soil and Plant Production Data by Lease, Nacimiento Lake

Lease	Soil Map Unit Symbol	% Slope (avg)	Ecological Site Name	Total Plant Prod (NI Yr) (lbs/ac/yr)	Forage Palatable to Cattle (NI Yr) (lbs/ac/yr)	Area (ac) (%)		Total Production for Lease (lbs/ac/yr)
N1	134	12	Fine Loamy	2,900	2,900	2	0.6	5,800
	135	23	Fine Loamy	2,900	2,900	12	3.9	34,800
	136	40	Fine Loamy	2,900	2,900	232	74.6	672,800
	137	63	Fine Loamy	2,900	2,900	3	1.0	8,700
	141	53	Shallow Coarse Loamy	1,700	850	5	1.6	4,250
	191	6	Fine Loamy Bottom	2,900	2,900	5	1.6	14,500
	202	40	Loamy North	2,250	2,250	16	5.1	36,000
	214	0	Water	0	0	36	11.6	0
	Total Palatable Production for Lease N1 (lbs/year)				776,850	311	100.0	776,850
N2	112	53	None	0	0	23	0.9	0
	134	12	Fine Loamy	2,900	2,900	73	2.9	211,700
	135	23	Fine Loamy	2,900	2,900	90	3.6	261,000
	136	40	Fine Loamy	2,900	2,900	401	15.9	1,162,900
	137	63	Fine Loamy	2,900	2,900	549	21.7	1,592,100
	141	53	Shallow Coarse Loamy	1,700	850	131	5.2	111,350
	142	23	Shallow Coarse Loamy	1,700	850	9	0.4	7,650
	190	53	Shallow Coarse Loamy	1,700	850	40	1.6	34,000
	191	6	Fine Loamy Bottom	2,900	2,900	34	1.3	98,600
	204	63	Loamy North	2,250	2,250	55	2.2	123,750
	W	0	Water	0	0	1,120	44.4	0
	Total Palatable Production for Lease N2 (lbs/year)				3,603,050	2,525	100.0	3,603,050
N3A&B	105	63	Coarse Loamy	2,750	2,750	5	0.1	13,750
	113	63	Loamy South	1,510	1,435	2	0.0	2,870
	134	12	Fine Loamy	2,900	2,900	209	4.3	606,100
	135	23	Fine Loamy	2,900	2,900	176	3.7	510,400
	136	40	Fine Loamy	2,900	2,900	958	19.9	2,778,200
	137	63	Fine Loamy	2,900	2,900	254	5.3	736,600
	141	53	Shallow Coarse Loamy	1,700	850	737	15.3	626,450
	143	53	Shallow Coarse Loamy	1,700	850	135	2.8	114,750
	148	6	Coarse Loamy Bottom	2,200	2,200	2	0.0	4,400
	154	63	Gravelly Fine Loamy	1,700	1,700	107	2.2	181,900
	162	63	Shallow Gravelly Loamy	735	441	36	0.7	15,876
	174	6	Fine Loamy Bottom	3,500	3,500	7	0.1	24,500
	177	20	Fine Loamy	2,900	2,900	9	0.2	26,100
	178	40	Fine Loamy	2,900	2,900	32	0.7	92,800
	190	53	Shallow Coarse Loamy	1,700	850	294	6.1	249,900
	191	6	Fine Loamy Bottom	2,900	2,900	60	1.2	174,000
	203	40	Loamy North	2,250	2,250	54	1.1	121,500
	204	53	Shallow Coarse Loamy	1,700	850	1,372	28.5	1,166,200
	214	0	Water	0	0	371	7.7	0
	Total Palatable Production for Lease N3A&B (lbs/year)				7,446,296	4,820	100.0	7,446,296
N5	101	6	Coarse Loamy	2500	2,500	32	2.6	80,000
	102	12	Coarse Loamy	2500	2,500	16	1.3	40,000
	105	63	Coarse Loamy	2750	2,750	22	1.8	60,500
	126	53	Shallow Coarse Loamy	1250	635	1	0.1	635
	134	12	Fine Loamy	2900	2,900	15	1.2	43,500
	135	23	Fine Loamy	2900	2,900	71	5.8	205,900
	136	40	Fine Loamy	2900	2,900	98	8.0	284,200
	137	63	Fine Loamy	2900	2,900	62	5.1	179,800
	141	53	Shallow Coarse Loamy	1700	850	63	5.2	53,550
	190	53	Shallow Coarse Loamy	1700	850	19	1.6	16,150
	214	0	Water	0	0	823	67.3	0
	Total Palatable Production for Lease N5 (lbs/year)				964,235	1,222	100.0	964,235

**NACITONE SOIL AND PLANT PRODUCTION EXAMPLE TABLE FOR LEASES AT
NACIMIENTO LAKE**

Example Summary of Soil and Plant Production Table:

Nacitone Soil and Plant Production Data by Lease, Nacimientto Lake

Lease	% Slope	Ecological Site Name	Total Plant Prod (NI Yr)	Forage Palatable to Cattle (NI Yr)	Area		Total Production for Lease
	(avg)		(lbs/ac/yr)	(lbs/ac/yr)	(ac)	(%)	(lbs/ac/yr)
N2	53	None	0	0	23	0.9	0
	12	Fine Loamy	2,900	2,900	73	2.9	211,700
	23	Fine Loamy	2,900	2,900	90	3.6	261,000
	40	Fine Loamy	2,900	2,900	401	15.9	1,162,900
	63	Fine Loamy	2,900	2,900	549	21.7	1,592,100
	53	Shallow Coarse Loamy	1,700	850	131	5.2	111,350
	23	Shallow Coarse Loamy	1,700	850	9	0.4	7,650
	53	Shallow Coarse Loamy	1,700	850	40	1.6	34,000
	6	Fine Loamy Bottom	2,900	2,900	34	1.3	98,600
	63	Loamy North	2,250	2,250	55	2.2	123,750
	0	Water	0	0	1,120	44.4	0
		Total Palatable Production for Lease N		3,603,050	2,525	100.0	3,603,050

Based on the table above, Lease 2 at Nacimientto Lake has a total of 2,525 acres with a total of 1,120 acres of water equaling 1,405 acres useable acreage.

Therefore, on the 1,405 acres of useable land the total average acre production palatable to cattle per year is estimated at 3,603,050 total pounds of production per year.

**NACITONE RANGELAND LEASES ECOLOGICAL SITE AND NATIVE PLANT
COMMUNITY TABLE**

Nacitone Rangeland Leases				
Ecological Sites and Characteristic Native Plant Community				
Ecological Site	Total Production		Characteristic Native Plant Community	Percent Composition
	Kind of year	Dry weight (lbs/acre)		
Clayey (1)	Favorable	3000	soft chess	70
	Normal	2300	remnant perennial grasses	
	Unfavorable	1600	filaree	
			annual clovers	20
			burclover	
			wild oats	
			riggut brome	
			wild barley	
			annual fescue	
			red brome	
Claypan (1)	Favorable	2500	soft chess	20
	Normal	1950	remnant perennial grasses	
	Unfavorable	1400	filaree	
			annual clovers	5
			annual trefoils	
			riggut brome	
			wild barley	
			annual fescue	
			red brome	
			wild carrot	
Coarse Loamy (2)	Favorable	2800	Soft chess	15
	Normal	2500	wild oats	10
	Unfavorable	1700	Blue oak	10
			foxtail fescue	10
			red brome	5
			Buckbrush	5
			Filaree	5
Coarse Loamy Bottom (2)	Favorable	2700	Soft chess	20
	Normal	2000	Wild oat	15
	Unfavorable	1500	Redstem filaree	10
			Burclover	5
			foxtail fescue	5
			Valley oak	5

Fine Loamy (2)	Favorable	3900	Soft chess	15
	Normal	2900	Wild oats	10
	Unfavorable	2200	Burclover	10
			Oak	10
			Filaree	10
			Needlegrass	10
			Annual lupine	5
Fine Loamy Bottom (2)	Favorable	5500	Soft chess	15
	Normal	3500	Wild oats	10
	Unfavorable	2500	Burclover	10
			Filaree	10
			Clover	10
			Oak	5
			Bluegrass	5
Gravelly Fine Loamy (2)	Favorable	2100	Soft chess	15
	Normal	1700	Blue oak	15
	Unfavorable	1500	Wild oats	10
			Filaree	10
			Red brome	5
			Burclover	5
			Oak	5
			Trefoil	5
Loamy (1)	Favorable	2500	soft chess	70
	Normal	2000	remnant perennial grasses	
	Unfavorable	1500	filaree	
			annual clovers	
			wild oats	
			ripgut brome	20
			wild barley	
			annual fescue	
			red brome	
			wild carrot	
			annual lupine	
Loamy North (2)	Favorable	2850	Blue oak	20
	Normal	2250	Soft chess	10
	Unfavorable	1700	Wild oats	10
			Ripgut brome	5
			Longtongue muttongrass	5
			Red brome	5
			Foxtail fescue	5
			Oak	5
Loamy South (2)	Favorable	2000	Soft chess	15
	Normal	1700	Wild oats	10
	Unfavorable	1300	Foxtail fescue	10
			Filaree	10
			Brome	5
			Turkey mullein	5