PURPOSE

This document outlines a plan for grazing management at the Petersen Ranch Mitigation Bank Properties (Bank Properties) and acts as an instructional document for the ranch manager. The ranch manager is the person in charge of the movement and management of livestock, and may be an employee or lessee of the Property Owner. Proper grazing management will be a key component to maintaining the condition and biological values of the Bank Properties. A preliminary analysis of the forage productivity and carrying capacity of the Bank Properties has been conducted to guide future grazing management from an ecological integrity and habitat management perspective. The purpose of this Grazing Plan is to provide the framework to determine the appropriate number of livestock the Bank Properties can support, while ensuring that all covered resources are protected and maintained through implementation of ecologically sound grazing practices. This document expands upon the associated Long-Term Management Plan (Exhibit D-5; LTMP; WRA 2014) to illuminate, and remain in compliance with, any grazing task in that document.

GOALS

Livestock grazing can play an important role in maintaining species diversity in grassland and scrub ecosystems (Barry 1996). The absence of grazing has been shown to have significant ecological effects in southwestern range and scrublands including increase in shrub cover, increase in non-native grass cover, changes to hydrology and dry matter ratios, decrease in species diversity and increased intensity of fire (Barry 1996, Manier 2007, Great Basin Restoration Initiative Workgroup (GBRIW) 2010).

The intent of this grazing plan is to achieve the goals and fulfill the requirements of the LTMP, with the primary intent being the maintenance of the covered resources within the Bank Properties. Historical grazing practices within the Bank Properties have included overgrazing and uncontrolled use by cattle. This grazing plan seeks to implement ecologically sound grazing practices to encourage a pre-settlement habitat structure, in which diverse vegetation types, heights, and moisture content are maintained in patches throughout the Bank Properties. This plan will meet these objectives through identification of appropriate stocking levels to reduce thatch, minimize fire hazards and manage invasive species.

SITE DESCRIPTION

Petersen Ranch Bank Property

The Petersen Ranch Bank Property has been historically used for cattle grazing for at least the last 100 years, and likely as far back as the Mexican Rancho period which began in 1821 (Duke 2013, Exhibit J of the BEI). Currently the Petersen Ranch Bank Property is lightly grazed during the winter and spring rainy season. Existing infrastructure includes perimeter and pasture fencing, a corral, developed springs and troughs. Additionally, exclusion fencing will be installed in the Petersen Ranch Bank Property that will exclude cattle from the rift valley wetland complex and select wetland features. This cattle exclusion fencing will include a 35-foot setback from select aquatic resources. The Petersen Ranch Bank Property consists of seven pastures totaling 3,689 acres that are available for grazing (Figure 1, Figure 2).

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There are 24 soil types (USDA 2014) documented within the Petersen Ranch Bank Property Grazing Areas. The following soil information is based on the Natural Resource Conservation Service (NRCS) online soil survey data. Vista coarse sandy loam (between 9-15 percent slopes) is the largest soil unit within the Petersen Grazing Area, accounting for approximately 1,360 acres. This soil is capable of producing 1,700 pounds per acre of forage in a favorable year. Amaragosa rocky, coarse, and sandy loams compose approximately 710 acres of the soils along the northeastern boundary, and are capable of annually producing approximately 1,000 pounds of forage per acre. Hanford loams (between 15 and 30 percent slopes) are the final major soil unit, and underlays approximately 590 acres of the Petersen Grazing Area. In a favorable year, is capable of producing approximately 1,100 pounds of forage per acre per year. The remaining 1,000 acres is underlain by a further 16 soil types which are capable of producing between 500 and 2,975 pounds of forage in a favorable year (USDA 2014). The distribution of soil productivity for favorable and unfavorable years at Petersen Ranch is depicted in Figures 3 and 4.

Vegetation within the Petersen Ranch Bank Property consists of 59 different land cover types that provide various quality and quantity of forage. Four land cover types (Chamise (*Adenostoma fasciculatum*), Desert Olive (*Forestiera pubescens*), Open Water and Roads) totaling approximately 420 acres were considered not to provide suitable forage for livestock, these land cover types are concentrated primarily in pastures 2, 6 and 7. Approximately 800 acres of the Petersen Ranch Bank Property consist of open herbaceous habitats that provide relatively high quantity and quality of forage consist of non-native annual grasslands (brome (*Bromus spp.*), cheatgrass (*B. tectorum*), barley (*Hordeum spp.*)) intermixed with native perennial grasslands (deergrass (*Muhlenbergia rigens*), wild rye (*Elymus spp.*)). The remaining acreage consists of mixed scrub habitats of varying densities supporting open patches of suitable forage.

Elizabeth Lake Bank Property

The Elizabeth Lake Bank Property has not been grazed for at least the last five years. In 2013 the Powerhouse Fire burned the Elizabeth Lake Bank Property removing most of the woody vegetation, though some stump sprouting is evident and some trees in riparian areas still remain. There are no immediate plans to graze the Elizabeth Lake Bank Property; however, fencing will be put in place to allow grazing following successful re-establishment of vegetation should the Property Owner find it an appropriate and useful management tool in accordance with this grazing plan. Additionally, cattle exclusion fencing is planned in the Elizabeth Lake Bank Property surrounding select sensitive aquatic resources to prevent grazing impacts to these areas.

The Elizabeth Lake Property includes three soil types: the Tujunga-Capistrano association is the largest in the Elizabeth Lake Grazing Area accounting for 192 acres. The Caperton-San Andreas-Modesto and Hanford soils are the other two soils representing 82 and 15 acres of the Elizabeth Lake Grazing Area respectively. All of the soils present in the Elizabeth Lake Grazing Area are capable of producing 1,100 pounds of forage per acre in favorable years according to the NRCS soils data (USDA 2014). The distribution of soil productivity at Elizabeth Lake, for favorable and unfavorable years, is depicted in Figures 5 and 6.

Vegetation within the Elizabeth Lake Bank Property is recovering from the Powerhouse Fire and the resulting landcover types and suitability of forage should be assessed prior to introduction of cattle, should grazing be introduced to this property.

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BENEFITS OF LOW-DENSITY GRAZING ON SEASONAL WETLANDS

It has been documented that high-intensity livestock grazing can negatively affect riparian areas, where overuse by cattle can lead to trampling damage and overbrowsing of riparian vegetation, erosion, and impacted water quality (Belsky et al. 1999). However, potential deleterious effects can be lessened through the management decisions proposed in this plan. Excluding cattle within mesic wetland and riparian areas through the use of exclusion fencing, and adjusting the timing, frequency and intensity of grazing in upland areas, will be used to minimize impacts to riparian areas and other sensitive aquatic features.

Wetland areas within the Petersen Ranch Bank Property where livestock will not be excluded include seasonal depression or swale wetlands dominated by annual grasses and forbs. Many studies have been conducted to determine the benefits of grazing on seasonal depression or swale wetlands dominated by annual grasses and forbs (Barry 1996, Marty 2004, Pyke and Marty 2005, Middleton et al. 2004, Collins et al. 1998, Hayes and Holl 2003). These studies have shown that seasonal and ephemeral wetlands dominated by annual species and surrounded by annual, non-native grasses, benefit from low- to moderate-intensity grazing. Wetlands of this type exhibited greater biodiversity and native annual forb species richness (Marty 2004, Pyke and Marty 2005, Middleton et al. 2006), longer-lasting wetland hydrology (Marty 2004), and less thatch accumulation (Barry 1996) when compared to areas which completely removed cattle from the previously-grazed wetlands. Complete removal of the cattle from these previously grazed areas led to shorter inundation of wetlands (Barry 1996, Marty 2004, Pyke and Marty 2005), accumulation of thatch (Marty 2004, Barry 1996), and reduced biodiversity (Collins et al. 1998, Middleton et al. 2006). These effects were accompanied by an increase in non-native annual forbs and grasses (Barry 1996) or encroachment of shrubs (Middleton et al. 2006) within and along the margin of the wetlands. These studies also recommend considering the effects of season of grazing and grazing intensity when creating a grazing plan as well as monitoring plant species, amount of unutilized forage (residual dry matter, RDM), and utilization (Barry 1996, Hayes and Holl 2003, Collins et al. 1998, Marty 2004, Pyke and Marty 2005).

This grazing plan and the adaptive management actions described in the LTMP were modeled in a way to account for these recommended management practices and include consideration of the amount of cattle, vegetation, dry matter, forage availability, and seasonality, among many other factors, before making the recommendations described herein. As supported by the publications listed above, these seasonal wetlands dominated by annual species can benefit from management by grazing when the grazing is managed in a way that takes these factors into consideration. Despite this, some wetlands may not benefit from grazing due to their semi-perennial nature. These wetlands have been identified and a perimeter of cattle exclusion fencing will be installed around these selected wetland features, setback 35 feet from the edge of wetland or riparian vegetation. If degradation of any of the wetlands is observed as a result of the cattle grazing in preservation areas, adjustments will be made to the management plan to correct these impacts.

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GRAZING MANAGEMENT

Grazing Carrying Capacity

Grazing capacity is an estimate of the number of grazing animals that the forage produced annually on a site can support. It is based on the forage availability of a site after accounting for a desired minimum amount of unutilized forage (RDM) left in the pastures at the beginning of the growing season. This minimum RDM target is selected to minimize erosion and to maintain soil fertility within the pastures.

Many public and private preserved lands require prescribed grazing as a management tool to promote healthy habitats for protected species, control invasive weeds, or reduce fire hazards. WRA has created the carrying capacity (Cowpacity) GIS model as a tool to help quantify optimal grazing regimes to meet management objectives. The Cowpacity model takes into consideration a pasture's soils, slope, vegetation, and distance to available water sources for livestock, to map minimum RDM targets, expected productivity, expected utilization patterns and the carrying capacity of a given pasture. The Cowpacity model uses data and recommendations from Bartolome et al. 2002, Holecheck 1998, NRCS Soil Survey Geographic (SSURGO) Soils Data, and field data when available. This model outputs values in Animal Unit Months (AUM, the amount of forage consumed by a single animal unit in a 30 day period, approximately 900 lbs.) so that the results can be applied to grazing operations of any animal type and duration.

Using the Cowpacity GIS model, WRA, determined the estimated carrying capacity for each pasture (Figures 7 through 10). The analysis was conducted using both favorable and unfavorable (dry/drought) years and is summarized in Table 1 below.

Table 1: Estimated Grazing Capacity (Animal Unit Month, AUM)

Pasture	Acres	Favorable Year AUM	Unfavorable Year AUM
1	1,078	442	97
2	844	163	28
3	636	161	34
4	78	30	6
5	53	3	0
6	483	61	6
7	517	30	3
8	276270	91	7
TOTAL	**3,968958.24**	**981**	**181**

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The above stocking rates are estimates, using the available soils data and assumptions of forage availability. Annual monitoring of RDM will take place at the end of each year's growing season. RDM data will be collected at sample points within each pasture and compared to the stocking rates for the year in combination with ecological data collected on-site, such as signs of erosion, or excessive weed regeneration which may be controlled by changes in grazing practices and/or herbicide application. The grazing capacity for each pasture will be calculated based on the previous year measurements. Actual stocking rates will be determined on an annual basis by the ranch manager in accordance with this grazing plan, and in conjunction with the Property Owner based on analyses of annual monitoring results. However the maximum number of cattle should

not exceed 164 Animal Units (adults or cow-calf pairs) over a 6 month period, unless RDM measurements demonstrate a higher carrying capacity is warranted. Flexibility in determining annual stocking rate is necessary to accommodate annual variation in weather, which can cause large variations in forage production (e.g. favorable year AUM versus unfavorable year), however the goal of the annual stocking rate is to ensure low-impact grazing to create heterogenic habitat structure, reduce thatch, minimize fire hazards and manage invasive species. Annual field measurements of forage production and actual stocking records will be used to update and modify the estimated carrying capacity.

Residual Dry Matter

RDM data provides an indication of the previous season's forage production and consumption by grazing animals (Bartolome et al. 2002) and is useful to land managers in making stocking rate decisions that will be beneficial to overall management objectives. Maintaining target RDM levels will help protect soil from erosion and nutrient loss and can promote an increase in the forage quality and quantity of grassland vegetation. In California annual grasslands, RDM levels have been shown to correlate with plant species composition and productivity within similar sites and climate conditions. However, the driving factors of herbaceous plant species composition in California annual grasslands are climate and site conditions such as soil type, tree cover, and slope (Bartolome et al. 1980, Bentley and Talbot 1951, Frost et al. 1997, and Jackson and Bartolome 2002).

While recommended RDM levels have not been determined for rangelands in this area, target RDM levels have been set using the recommendations for dry annual grasslands (with average annual rainfall totaling less than 12 inches) from the publication *California guidelines for Residual Dry Matter (RDM) management on coastal and foothill annual rangelands* (Bartolome et al. 2002). To preserve soil stability and productivity, higher target RDM levels are recommended in areas with low woody cover, and steep slopes, with lower RDM levels needed on flatter, and/or more densely vegetated habitats. The Bank Property has significant variation in topography, and RDM targets will vary across the site from 100 pounds per acre in the flattest areas, to 800 pounds per acre in the steepest grassland areas (Figures 11 and 12). An average RDM of 500 pounds per acre should be maintained in most pastures throughout the Bank Properties.

Cattle Exclusion Areas

Wetlands and riparian zones are particularly sensitive to deleterious effects of cattle grazing due to nutrient inputs, sedimentation, erosion, and over utilization of riparian vegetation during the summer months. Several federal, state and regional agencies including the U.S. Forest Service (Clary and Webster 1989), U.S. Bureau of Land Management (BLM 2006), and Tahoe Regional Planning Association (TRPA 2012), encourage grazing management practices, such as exclusion, rotation, and season of rest to protect riparian resources.

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Numerous studies have highlighted the benefits of grazing setbacks around wetland and riparian areas to control pollution associated with cattle operations (Borin and Bigon 2002, Osborne and Kovacic 1993, Tate et al. 2004, Tate et al. 2006, Young et al. 1980). Grazing setbacks around wetland and riparian areas encourage the development of vegetated buffer strips. Vegetated buffer strips comprised of just five meters (16.4 feet) of herbaceous vegetation and one meter (3.3 feet) of woody vegetation have been shown to significantly reduce nitrogen pollution to streams and wetlands through uptake in aboveground plant biomass (Borin and Bigon 2002). Five-meter grass buffer strips have been shown to reduce fecal bacteria pollution (Tate et al. 2004, Tate et al. 2006).

The Petersen Ranch Bank Property contains wetland and riparian habitats of varying quality and hydrology, ranging from xeric alluvial floodplain, to more mesic seasonal wetland, riparian wetland, and freshwater marsh. In order to decrease the potential deleterious effects to wetland and riparian resources, and increase colonization by hydrophytic plants, 35-foot grazing setbacks will be established around selected wetland and riparian habitats (Figure 1, Figure 2). Thirty-five foot setbacks are based on policies established by the Tahoe Regional Planning Agency (TRPA) livestock grazing standards for grazing in areas adjacent to stream channels. TRPA maintains some of the strictest water quality standards in the state and are used here in absence of any local or regional standards. Cattle grazing will be excluded within 35-foot setbacks around the entire rift valley riparian area and other mesic wetland and riparian features (Figure 1, Figure 2) through installation of exclusion fencing. This will help improve and preserve existing riparian habitat and ensure successful re-establishment of mature aquatic and riparian vegetation communities.

The 35-foot grazing setbacks within the selected wetland and riparian areas will enhance wetland and riparian habitats. The fenced grazing exclusion areas will protect aquatic resources from potential eutrophication, sedimentation, nutrient deposition, and fecal bacteria originating from upland pastures. Expansion of woody vegetation within the grazing exclusion areas will improve habitat and water quality conditions for the watershed. Low density grazing within seasonal wetland areas outside of grazing exclusion areas is expected to maintain habitat conditions through the removal of thatch and control of non-native grasses. Grazing impacts will be monitored within grazed seasonal wetland areas. If excessive soil compaction, trampling or overgrazing of wetland areas is observed, adaptive management measures such as placement of supplemental salt or hay in upland areas away from wetlands will be considered. If supplemental attractants are deemed necessary to prevent negative impacts to wetlands, supplements should be placed no closer than one-quarter mile from the impacted wetland. Occasionally, grazing within the exclusion areas may be desirable to control invasive species or a build-up of thatch or fuels. If deemed necessary for management objectives, and subject to IRT approval, grazing in these areas would be conducted after the end of season rains, but while grasses are still green. Careful timing of grazing after rains have stopped and the ground has hardened will protect soil stability around wetlands and will prevent excess nutrient inputs into the downstream waters. Grazing while grasses are still green will prevent cattle from over-utilizing riparian vegetation as cattle preferentially forage on protein rich grasses when available and will be less inclined to loaf in riparian habitats when temperatures are cool.

Cattle exclusion fencing will be erected around the Spineflower Introduction Area (Figure 2), within which the State-listed endangered and Federally proposed threatened San Fernando Valley spineflower (*Chorizanthe parryi* var. fernandina) ("Spineflower") will be introduced following the San Fernando Valley Spineflower Introduction Plan (Exhibit E-4.6 Appendix C). An easement over the Introduction Area has been granted to Newhall Land and Farming Company LLP ("Newhall") to allow for the introduction of the Spineflower on the Elizabeth Lake Bank Property

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(Exhibit E-4.6 Appendix A). Newhall will be solely responsible for all monitoring and maintenance of the cattle exclusion fencing surrounding the Introduction Area.

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Thatch Removal

The primary ecological issue with allowing grasses to grow uncontrolled is the accumulation of thatch at the end of each growing season. Thatch is capable of dramatically altering an ecosystem by changing soil temperature and moisture, allowing further infestation by invasive species, and increasing fire risk. Grazing to reduce forage levels to, or near, the target RDM levels will reduce thatch build up. If patchy utilization results in observations of increased thatch build-up in specific areas of a pasture, increased stocking rates, or attractants such as salt licks or molasses may be used to encourage grazing in these target areas until thatch is reduced.

Fuels Reduction

Historically, sagebrush (*Artemisia sp.*) plant communities had shorter intervals between wildfire, and when the wildfires occurred, they were smaller and less intense. These fires lead to a many successional stages within any given area. As fire moved through those successional stages, it would reach different fuel heights and vegetation moisture content, leading to smaller localized fires (GBRIW 2010).

Since the introduction of livestock across the American West, several important factors have combined to dramatically change the historic fire regime. With the introduction of feed-grains, several species of non-native annual grasses were naturalized throughout the region. These grasses invade the interstitial space between native bunchgrasses and slowly outcompete native grasses, creating homogenous stands of non-native annual grasslands. In contrast to native perennial bunchgrasses, non-native annual grasses die completely in the summer leaving a highly flammable thatch layer spread across the habitat. As this transition was happening, the land became actively managed and a policy of zero fire was implemented across the American West. That combination of factors created large banks of fuel material leading to very large, hot fires (GBRIW 2010). Diverse microhabitats offer natural fire suppression and create a fuel environment that is less likely to result in catastrophic high-intensity fires.

To reduce fuel loads, the prescribed grazing regime within the Bank Property will focus on reducing thatch, minimizing the encroachment of shrubs into the open grassland habitats, and grazing scrub lands to create and maintain openings. Stocking rates should be set to utilize forage throughout all pastures to reduce RDM to near the target levels.

Invasive Species Management

Grazing can be an effective method to control invasive plant species when used in conjunction with other eradication methods such as physical removal or herbicide applications (DiTomaso 2000). Prescribed grazing treatments may be utilized to control invasive species within the Bank Properties. Through modifying the season of grazing within a pasture, use of attractants such as salt licks, molasses or other supplements, changing the location or availability of water sources, modifying stocking rates, or through the use of temporary electric fencing to facilitate flash grazing of a specific area. Regardless of the prescribed grazing treatment that is used, the most important consideration is that treatments are carefully timed to take advantage of the target plant's phenology. The ranch manager will work closely with the Property Owner when prescribing grazing treatments, as well as any other physical or chemical treatments allowed per the LTMP, to coordinate the timing and application of any necessary treatments to ensure they are applied in a period that avoids impacts to the native biodiversity in the area.

Maintaining Habitat for Swainson's Hawk

Grazing the Bank Properties will help maintain suitable foraging habitat for Swainson's hawk (*Buteo swainsoni*). The primary mechanism for this benefit is the effect grazing has on preventing encroachment of shrubs into open grasslands and creating openings in scrub habitats (GBRIW 2010). This will protect existing Swainson's hawk foraging habitat within the Bank. A secondary benefit is that grazing to achieve the target RDM levels will keep grasses short, improving habitat for prey, and maintaining prey visibility for Swainson's hawks. Since small rodents and grasshoppers make up a large part of the Swainson's hawk diet, attempts should not be made to control these populations.

Maintaining Habitat for Tricolored Blackbird

Grazing the Petersen Ranch Property will help maintain suitable foraging habitat for tricolored blackbird (*Agelaius tricolor*), a State species of special concern. Natural foraging habitats for the species include marshes and wetlands, vernal pools and other seasonal water features (wet and dry), grasslands, and scrublands (including riparian). Tricolored blackbird will benefit from implementation of this grazing plan in two ways. First off, the 35-foot grazing setback will be implemented around the perennial marsh on the Petersen Ranch Property and the Elizabeth Lake Property that provide tricolored blackbird breeding habitat. Grazing to meet target RDM levels in the surrounding areas outside of the setback will improve foraging conditions for the species by keeping the vegetation at an optimal height (less than 15 centimeters [6 inches]) which provides access to insect prey (Beedy and Hamilton 1999).

Bank Phasing

The Bank will be established, and conservation easements will be placed over the Bank Properties, in phases to meet the market demand for mitigation within the service area(s). The Bank will be established in phases comprised of six geographic Areas (Area A – Area F). Phase 1 includes Area A of the Petersen Ranch Bank Property and Area E of the Elizabeth Lake Bank Property. The Grazing Plan is intended to be implemented over the entire Bank Property, but it is only required to be implemented in Areas that have been incorporated into the Bank through an approved Phase.

Pastures do not always follow the boundaries of the Areas, in these cases the grazing plan will be implemented over the entirety of any pasture that is partially within an Area that has been incorporated into the Bank. For example, pastures 1, 3, and 6 are partially within Area A, therefore the entirety of pastures 1, 3 and 6 will be managed according to this Grazing Plan upon Bank Establishment. Pastures entirely outside of the conservation easement for Phase 1 (i.e. Pasture 2 and Pasture 5) are not required to be managed according to this Grazing Plan until a Conservation Easement is recorded over the phases that contain those pastures.

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CONCLUSION

The primary goal of the grazing operation is low-impact grazing that complies with any task set forth in the LTMP. This document has been created to provide a framework to guide grazing management, which the Grazing Lessee will consult to maintain a grazing regime that will provide the greatest ecological benefit to the Bank Properties. This plan provides the framework to determine the appropriate number of livestock that the Bank Properties can support, while ensuring that all covered resources are protected and maintained, in compliance with the LTMP. Annual RDM monitoring data will be used to generate target RDM values and stocking rates, which should not exceed the maximum number of cattle, based on a 6-month grazing rotation, unless approved by the IRT. Cattle exclusion fencing, as well as targeted grazing for invasive species management and maintenance of special-status species habitats, will ensure that sensitive resources are protected and maintained through adherence to this plan.

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