

**Grazing Management Plan
Antioch Dunes National Wildlife Refuge, Stamm Unit
Antioch, California
Grazing Season 2008**

Introduction

The Antioch Dunes National Wildlife Refuge (ADNWR) is a unique inland dune ecosystem host to a number of endemic, rare plants and animals, USDI, Biological Opinion. The management of the ADNWR has consisted of various techniques including mechanical and chemical treatments to eliminate non-native vegetation and enhance several species of status. Species of status include Lange's Metalmark Butterfly, *Apodemia mormo langei*, and its host plant, naked stem buckwheat, *Eriogonum nudum* var. *auriculatum*. In addition there are two endemic federally endangered plant species, the Contra Costa Wallflower, *Erysimum capitatum* var. *angustatum*, and the Antioch Dunes Evening Primrose *Oenothera deltoiodes* spp. *howellii*.

Site Description

The Antioch Dunes National Wildlife Refuge is located in Contra Costa County, California. It is a unique inland riverine dune ecosystem that is inhabited by a number of endemic and rare plants and animals. The site is located approximately 40 miles northeast of San Francisco near the confluence of the Sacramento and San Joaquin rivers, on the south bank of the San Joaquin River. The Refuge is currently divided between two sites, the 44-acre Stamm unit and the 11-acre Sardis Unit, with an additional 14 acres on either side of the Sardis Unit owned by Pacific Gas and Electric.

The dune system originated from the sediment produced by glacial activity in the Sierra Nevada Mountains and southern Cascade Range. The Dunes may function as relictual habitat that contains ecological factors, which are characteristic of drier warmer regions such as the southern San Joaquin Valley or the Mojave Desert (Powell 1981).

Management background and need for change

In August 2002, a comprehensive conservation plan summary was released for Antioch Dunes, National Wildlife Refuge. The purpose of the plan was to provide managers with a 15-year strategy for achieving the refuge purposes and contributing toward the mission of the National Wildlife Refuge System.

Issues identified by Refuge staff and others, included control of nonnative weeds, identification and development of techniques for successful dune restoration and consultation with experts in dune ecology, restoration and nonnative weeds.

During the past several years, in spite of the efforts of staff and volunteers, minimal disturbance has occurred on the ADNWR site. The vegetation has changed over time and the system is dominated by undesirable species, which are "crowding out" the desired species.

The combination of depleted sand, the extensive over-growth of the invasive non-native vegetation and wildfires have seriously degraded the dune habitat, so much that the Lange's metal mark butterfly, as well as the two listed plants, are in serious risk of extinction or extirpation if remedial actions are not implemented.

Management measures have been implemented over the past several years, including chemical, mechanical, and hand pulling as methods for control of nonnative species. These practices, have worked but the invasive of non-natives continues to spread. A faster, more uniform system of controlling the invasive species is the premise for this project.

Grazing Prescription

Grazing is a means of managing the invasive species. Application of grazing to manage invasive species is well documented. In checker spot butterfly habitats, grazing has been used to reduce competition from invasive species. In this project, I propose to use grazing to reduce the competitive ability of invasive annuals so the endangered species have a chance to grow and reproduce. Grazing will be monitored closely to minimize negative effects on the endangered species of interest.

Assumptions:

The first assumption is that grazing to a predetermined level will be beneficial for the desired species by removing non-native invasive plants.

- Desired species require an open sand habitat. Past management actions have not been effective on a large scale to remove non-desirable vegetation. There has been no net gain in desirable vegetation or open sand habitat.

The second assumption is that grazing will cause some trampling of desirable plant species.

- Any detrimental impacts to desired species caused by grazing would be regarded as research impacts. Detrimental impacts will be minimized as much as possible by pre-determining a trampling/browsing threshold and careful monitoring. A "fast response" to remove cattle once a threshold has been reached will minimize incidental damage to plants or the butterfly. The consultant or the rancher will not be held liable for incidental trampling effects. Level of grazing and timing of cattle movement will be determined by the Range Professional and the cattle producer.

The project involves the use of grazing animals, beef cattle, to control the growth and invasion of undesired plant species. These species include rip-gut brome, *Bromus diandrus*, common vetch, *Vicia villosa*, and yellow star thistle, *Centaurea solstitialis*. The project will use different grazing intensities to achieve the removal of undesired species. The project will determine the proper grazing stock rate that will reduce or eliminate these invasive species.

Objectives

The objectives are to determine if grazing can be used to reduce the density and cover of invasive species and to determine if livestock grazing and hoof activity will produce adequate soil surface disturbance that will improve the density, cover, or productivity of the endangered species of interest. Grey and Holl (2003) found species richness and cover of native annual forbs was higher in sites grazed by cattle than in ungrazed sites. However, they also observed that native perennial forbs showed a trend opposite to that of the native annual forbs. Native perennial forb cover and species richness were high in ungrazed sites. Therefore, the objectives will be to test the hypothesis that grazing these sites will reduce the cover of invasive perennial grasses and open sites for desired perennial forbs.

The experiment will be conducted in two pastures, with two grazing intensities. Noy-Meir et al. 1989, observed that in moderate to heavy grazing the vertical differential defoliation gradient imposed by cattle, particularly early in the growing season, was the major mechanism of grassland change. So the grazing intensities will be two fold: one pasture will be grazed to a "light" intensity and the other pasture will be grazed to a "heavy" intensity. The two different grazing intensities will be determined through the measurement of Residual Dry Matter (RDM) and the comparative yield (CY) method. George et al (2006) found that the CY method could be used with confidence throughout the year to determine herbage standing crop.

The pastures will be grazed by not less than 5 or no more than 15 cattle during each graze period. The animals will be moved when forage utilization in the pastures reaches the recommended level of RDM. RDM is the amount of herbaceous biomass that should be left at the end of the grazing season to provide suitable conditions for germination of the following year's forage crop and for soil protection. RDM should be subtracted from forage production estimates to estimate available forage. Professional opinions as to appropriate RDM levels vary to some degree and are dependent on individual landowner's objectives.

Restoration objectives should be realistic, based on site considerations, Barry and Larson (2004). Beef cattle will be used because of their preference for grasses. The objectives are based on these preferences, since perennial invasive grasses are highest amount of undesired species to be removed.

Measurable Objectives

1. Reduce invasive species density and cover by 30%, light grazing treatment, and 50%, heavy grazing treatment
2. An increase of bare ground by 30%
3. Maintain or increase buckwheat density and cover, without impact from grazing
4. Establish a baseline of impact with two different grazing intensities, light and heavy

Current Facilities at Antioch Dunes

Fencing: All of the fences at Antioch Dunes will be established prior to cattle grazing. The Antioch Dunes staff will construct the interior fences that will divide the pastures.

Corral: A temporary corral for moving livestock on and off the site is located at the property (Figure 3). The Range Professional and the cattle producer will be responsible for the materials and maintenance of the corral.

Water and troughs: A water troughs will be placed in each pasture, or shared by pastures, for the cattle. Antioch Dunes staff will be responsible for maintaining water on site.

Supplements: the cattle producer, if deemed necessary will provide supplements for the cattle.

Figure 1. Timetable for Meeting Objectives

Objective	Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sept	Oct	Nov	Dec
1. Reduce invasive species density and cover												
2. Maintain or increase buckwheat density and cover												
3. Measure impact of livestock grazing intensities												

Animal Distribution

The way animals are distributed on a site affects the site’s grazing capacity as well as how resources are differentially impacted. Typically, attractants such as water sources and feed supplements are placed in strategic areas within a given site to help to distribute animals so that forage will be evenly utilized. Water will be placed in both pastures, so cattle will always have access to water. If deemed necessary by the

Range Professional and cattle producer, supplement will be placed at the opposite end of the pasture to increase cattle distribution.

Stocking Rate Adjustments

Stocking rates may need to be adjusted from estimates projected in this plan and in response to weather variation and resultant fluctuations in biomass production. In years when rainfall is unusually low and/or poorly distributed, forage production will be lower than normal. In such years, animal may need to be removed from the site earlier than usual and/or stocking rate will need to be decreased to meet the desired RDM target. Because early removal may present an inconvenience for the lessee, provisions for early removal should be made a condition of the lease. The term of the grazing period is for a minimum of one month to a maximum of 3 months. The lessee will be paid for a 3-month graze period whether or not the cattle are on the property for that length of time.

The RDM monitoring is discussed in the Monitoring and Measurements Section.

Figure 2. Timing of Grazing:

Timing of Grazing	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Pasture 1												
Pasture 2												

Light Grazing: > 5 cattle
Heavy Grazing: ~ 10 cattle

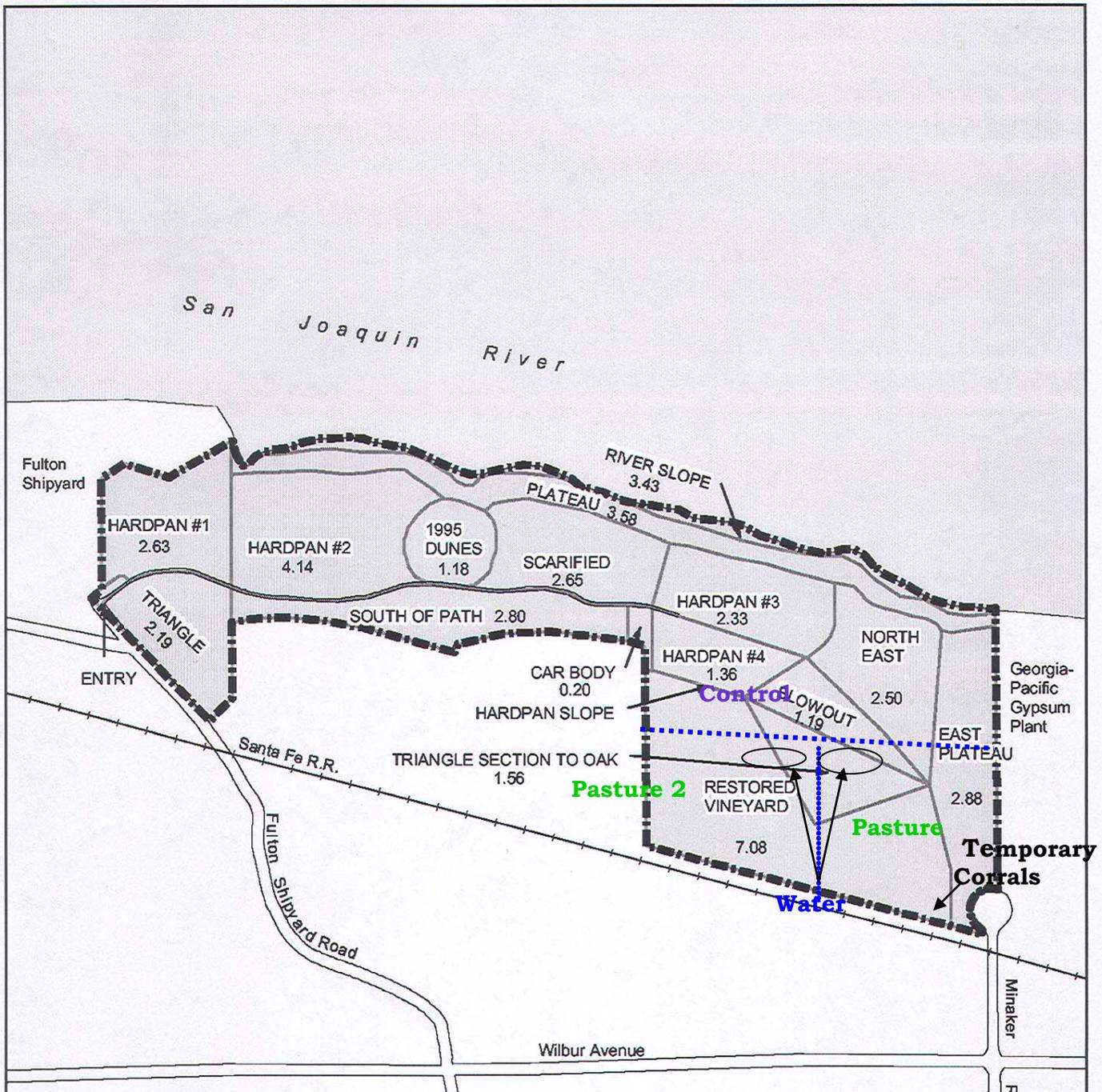
Grazing will begin March 2008. Initial RDM levels will be taken to determined pre grazing RDM levels and forage species composition. Light grazing regime will be measured as a reduction in standing vegetation of 30% and the heavy grazing regime will be a reduction of 50% of standing vegetation. Species of interest will be marked and monitored for grazing impacts.

Pasture 2 will be the heavy graze treatment because of the forage present. Five to ten cattle will be placed in Pasture 2 until objectives are met. Cattle will be moved to Pasture 1 and will graze under the light grazing regime. The number of cattle and the length of the graze period will depend on the grazing conditions of each pasture. The initial placement of the cattle will be monitored every day for the first week and once a week after that until the end of the first month. Adjustments to the grazing plan will be made by the Range Professional, the cattle producer and by the supervisor of Antioch Dunes.

After a desired level in the light grazing regime, all cattle will be placed back into in Pasture 2. The cattle will be monitored everyday for the first week, followed by weekly visits for the rest of the grazing period. If rainfall patterns and forage growth permits, cattle will remain on site until the vegetation objectives have been met. Cattle will be moved between pastures, maintaining the light and heavy grazing regimes. Once objectives are met, the rancher will be notified and given one week to remove the cattle.

The map, entitled “Figure 3, Management Areas with Acreages, Stamm Unit” shows the outline of the project area. There will be two pastures, with water sources in each pasture. The temporary corrals will be in pasture 1, closest to the Minaker Road entrance. They will be used to unload and gather cattle. The control area is north of the two fenced areas.

Figure 3. Management Areas with Acreages - Stamm Unit



Monitoring and Measurements

Because livestock grazing can impact critical habitat if not done properly, rigorous monitoring of cattle effects must be conducted to ensure that impacts to desired species are none to minimal. The contractor will monitor the effects of livestock grazing impacts on a daily and/or weekly basis during the grazing season. The contractor will monitor impacts by: 1) photo-points, 2) evidence of grazing impacts on buckwheat, and 3) RDM and comparative yield measurements.

Photo-points are a valued method of recording change over time in relation to a management regime such as grazing. Repeated photos taken in the same location will provide visual data of the long-term effects of cattle grazing. At least six photo site locations, three per pasture, will be established and the direction of the photos will be recorded. Digital photos will be taken each week from when the cattle are released to when they are removed.

Evidence of grazing impacts on Buckwheat will be conducted by establishing several transects in the grazed and ungrazed pastures. Along a 100-foot transect, individual buckwheat plants will be marked and measured to determine impact, if any by grazing. Evidence of biting, will be evaluated as impact from cattle.

The RDM measurements will be taken along each transect. The RDM goal will be light grazing a 30% reduction of standing vegetation and heavy grazing, a 50% reduction of standing vegetation. The RDM measurements in each pasture will be taken upon cattle removal and in late August. RDM will be estimated using two methods: 1) clip plots and 2) ocular. The use of both methods in conjunction, will provide a good estimation of RDM present (Guenther 1998) without the utilization of systematic clip sampling. Both pastures will be assessed on the evidence of increased bare ground. An increase of 30% bare ground is desired. The reduction of RDM and the presence of bare ground will be used to evaluate the effectiveness of grazing to remove non-native annual and perennial plants.

Monitoring of vegetation at Antioch Dunes will be conducted to determine if the objectives are being met and to further assist in evaluating the effects of the Antioch Dunes National Wildlife Refuge grazing management plan. Data collected from the two grazed pastures and will be compared to data from the ungrazed pasture (Control) and to pre-grazing data for all pastures.

Public Outreach

Antioch Dunes is a closed unit of the Refuge due to the sensitivity of the endangered species. Therefore, it is important to ensure that the public understands the reasons behind the use of cattle as a management tool. The Range Professional will work with Antioch Dunes staff to provide educational outreach to anyone interested in learning more about the management techniques.

Cooperation with Beef Cattle Producer

The contractor, the Range Professional, has entered into a legal agreement with the U.S. Fish and Wildlife Service entitled a Cooperative Land Management Agreement (USFWS 2003b). The Range Professional will work directly with the cattle producer. This plan will be reviewed before the beginning of the second year of grazing. Needed adjustments to the plan will be discussed between the Range Professional and Antioch Dunes staff.

References

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