MADERA IRRIGATION DISTRICT WATER SUPPLY ENHANCEMENT PROJECT

FINAL ENVIRONMENTAL IMPACT STATEMENT

Appendix C: Madera Ranch Mitigation, Grazing, and Management Plan

June 2011

FINAL

MADERA RANCH
MITIGATION, GRAZING AND MANAGEMENT PLAN

PREPARED FOR:

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Contents

Tables

Page

Figures

Follows Page

Acronyms and Abbreviations

AU	Animal Unit
Basin Plan	Water Quality Control Plan for the Sacramento and San Joaquin River Basins
BMPs	best management practices
CALFIRE	California Department of Forestry and Fire Protection
CARB	California Air Resources Board
CESA	California Endangered Species Act
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
CRT	California Rangeland Trust
CWA	Clean Water Act
DFG	California Department of Fish and Game
EDRR	early detection rapid response
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
GMU	grazing management unit
GPS	Global Positioning System
IVM	integrated vegetation management
Management Plan	Grazing and Management Plan
MCMAVCD	Madera County Mosquito Abatement & Vector Control District
MID	Madera Irrigation District
MOCP	Monitoring and Operational Constraints Plan
MROC	Madera Ranch Oversight Committee
NFWF	National Fish and Wildlife Foundation
NRCS	Natural Resources Conservation Service
RDM	residual dry matter
Reclamation	U.S. Bureau of Reclamation
TDS	total dissolved solids
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WSEP	Water Supply Enhancement Project

Madera Ranch Mitigation, Grazing, and Management Plan

1 Introduction and Purpose

Madera Irrigation District (MID) owns Madera Ranch in southwest Madera County, California. The 13,646-acre property was acquired in 1995 with the intent of developing a water bank to utilize the aquifer beneath Madera Ranch and to extract the banked water for later use. In 1998 MID sold approximately 2,700 acres of cultivated lands to Grimmway Farms, retaining water banking related easement rights and retaining 10,946 acres for water banking, mitigation, and continued grazing operations.

This document presents the Mitigation, Grazing, and Management Plan (Mitigation and Management Plan) for the portions of Madera Ranch owned by MID. The purpose of this document is to provide MID, Grimmway, its grazing operator, and its conservation easement holder with specific guidelines regarding suitable activities for the property, land management recommendations and techniques, mitigation, and monitoring obligations to facilitate long-term sustainable operations. The Mitigation and Management Plan is also intended to provide information to support the regulatory requirements associated with local, state, and federal permits, including information to support mitigation associated with the federal Endangered Species Act (ESA), the California Endangered Species Act (CESA), the Clean Water Act (CWA) Section 404, and the U.S. Army Corps of Engineers (Corps) regulations stated under 33 CFR Parts 325 and 332 and District guidelines.

2 Project Overview

2.1 Location

Madera Ranch is located in southwest Madera County approximately four miles southwest of the city of Madera, south of the Fresno River and north of the San Joaquin River (Figure 1). It occurs on all or parts of 21 sections in Township 12 South, Range 16 East, on the Bonita Ranch and Firebaugh 7.5-minute U.S. Geological Survey topographic maps; Section numbers provide useful guidance for overall management and location context and are used throughout the remainder of the document.

2.2 Project Summary

MID is proposing to develop a Water Supply Enhancement Project (WSEP) on Madera Ranch. The project would be completed in two phases. Phase 1 would involve expanding delivery facilities and using natural swales to bank water (i.e., store water underground for later recovery and use). Phase 2 would involve constructing supplemental recharge facilities and facilities to recover banked water. Phase 1 and 2 project facilities are illustrated in Figure 2. MID ultimately would be able to bank a capacity of 250,000 af and recharge and recover a maximum of 55,000 af annually.

Phase 1 activities would involve:

- reconditioning and extending canals to provide at least 200 cubic feet per second (cfs) of conveyance capacity into Madera Ranch to Gravelly Ford Canal and swales throughout the site;
- constructing approximately 55 acres of recharge basins on current agricultural land to regulate flow deliveries, remove suspended sediment, and provide some recharge;
- reconditioning Gravelly Ford Canal;
- applying recharge flows to 550 acres of natural swales; and
- integrating 2,600 acres of Madera Ranch row crops owned by Grimmway farms into an in-lieu recharge program in which surface water periodically would be served in lieu of groundwater pumping subject to approval by the Madera Ranch Oversight Committee (MROC).

Phase 2 activities for recharge and recovery facilities would involve:

- construction of up to 323 acres of new on-site recharge basins and canals as required to supplement Phase 1 facilities and achieve 200 cfs of recharge capacity,
- use of up to 15 existing on-site wells for recovery,
- installation of up to 49 new on-site wells and recovery pipelines (in phases over several years) to provide 200 cfs of recovery/pump-back capacity, and
- installation of up to 12 lift stations off-site on MID canals and one lift station on-site on Gravelly Ford Canal (in phases over several years) to provide 200 cfs of recovery/pump-back capacity into the MID service area.

Construction of facilities and use of the swales will result in temporary and permanent direct effects on vernal pools and alkali rain pools, and potentially listed animals and plants, that necessitate mitigation under the ESA and Section 404 of the CWA. These effects and associated project conditions are described in detail in the permits associated with these regulations.

2.3 Site Characteristics

The majority of Madera Ranch consists of annual and alkali grasslands grazed by cattle for the past 25 years. Vernal pools, alkali rain pools, and slickspots/scalds (areas of high soil salinity or alkalinity that lack vegetation) are scattered within the grassland. In addition to grazing land uses, the ranch has a number of dirt access roads, irrigation wells, electric distribution lines, canals, drainage ditches, and residential/ranch buildings. The Gravelly Ford Canal bisects the property conveying water from the San Joaquin River from south to north, and Cottonwood Creek crosses the southern portion of the property in Section 28. Detailed site characteristics are described in the wetland delineation (ICF Jones & Stokes 2009).

Other site characteristics are described briefly below to support Corps' District guidelines (and additional site-specific requirements related to vernal pool creation are described in MID's Creation, Re-Establishment, and Monitoring Program [Vollmar 2011]).

2.3.1 Jurisdictional Areas

MID obtained a preliminary jurisdictional determination that includes 242.1 acres of wetlands on site and 38.38 acres of wetlands off site. On-site wetlands include alkali rain pools (16.33 acres), vernal pools (21.22 acres), seasonal wetlands (153.3 acres), Cottonwood Creek (4.16 acres),

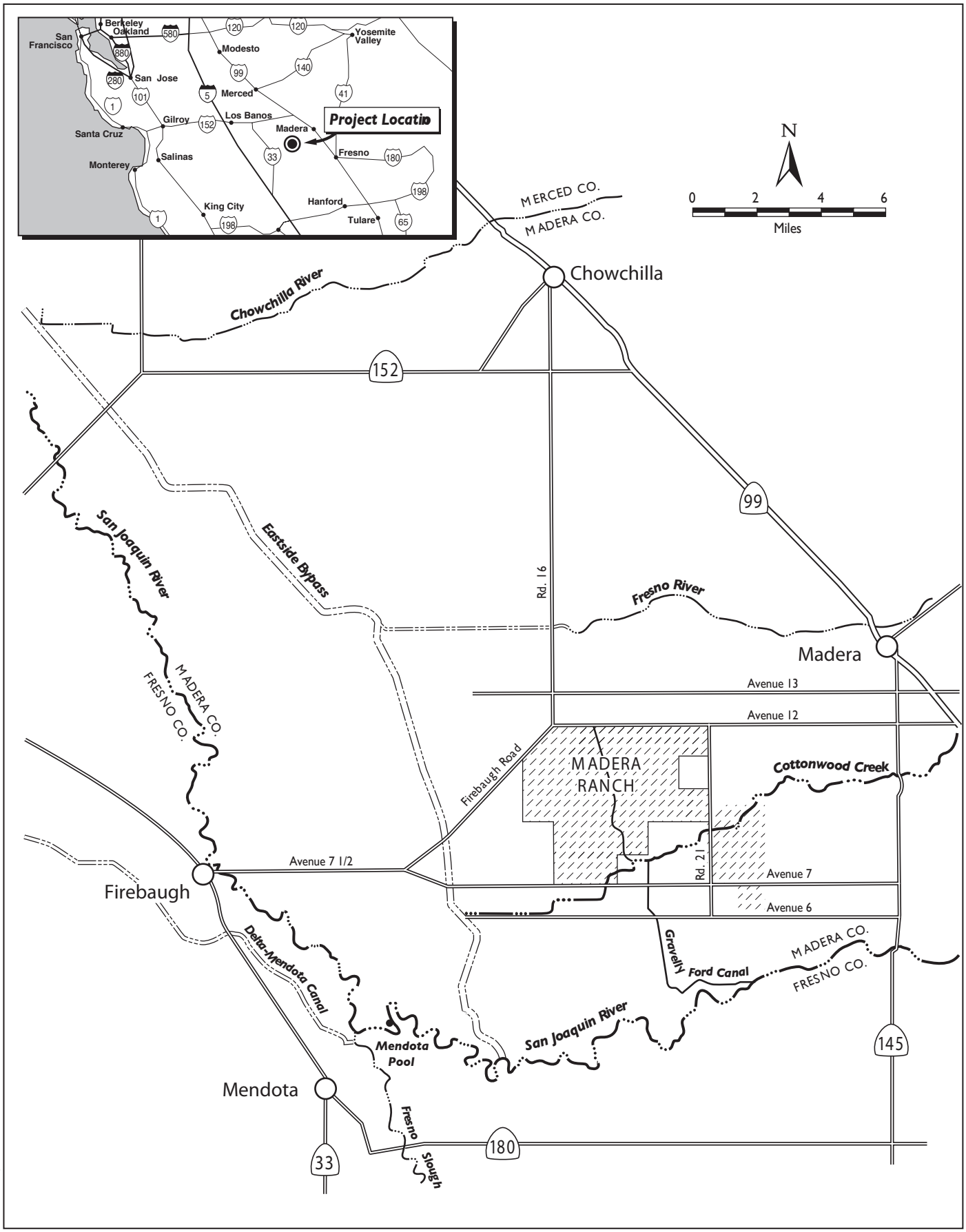

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Figure 1
Madera Ranch Location Map

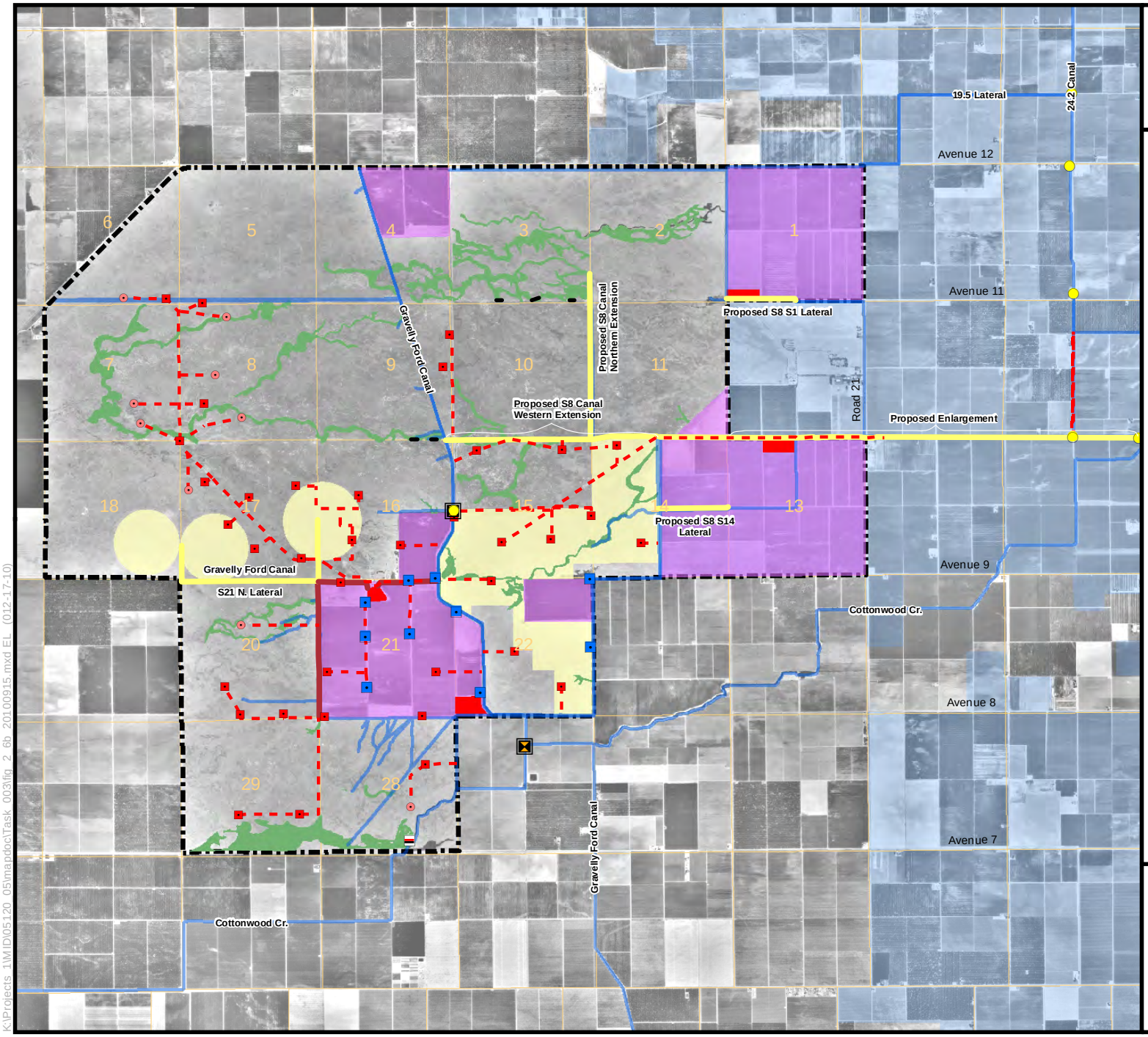

Figure 2
Phase 1 and Phase 2 Recharge and Recovery Facilities

Legend

- Section Line
- Madera Ranch Boundary
- Madera Irrigation District
- Swale Recharge Areas
- Existing Wells

Phase 1 Improvements

- Hardened Sill
- Weir
- Recharge Basins
- On-Ranch, In-Lieu Recharge Facilities (existing row crops and vineyards)
- Conveyances
- Gravelly Ford Canal and Lateral Improvements
- Canal Improvements
- Proposed Berm

Phase 2 Improvements

- New Wells - Optimistic Approach*
- New Wells - Conservative Approach*
- Preliminary Lift Station Location
- Potential Recharge Areas
- Buried Recovery Piping

* The actual number and locations of new wells may vary from those depicted here, following detailed engineering design and adjustment during staged installation. For the purposes of this document, it was assumed that all wells depicted in this figure may be constructed and/or used.

0 0.5 1
Miles

Aerial Photo Source: USGS Digital Orthophoto Quarter Quadrangle, 1993

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Gravelly Ford Canal (33.99 acres), and other canals (13.11 acres). Off-site wetlands predominantly include canals such as the 24.2 Canal (3.35 acres), Cottonwood Creek (23.73 acres), Gravelly Ford Canal (3.03 acres), Main Number 1 Canal (0.22 acre), Main Number 2 Canal (2.95 acres), Section 8 Canal (4.83 acres), and other canals (0.27 acre) (ICF Jones & Stokes 2009).

2.3.2 Aquatic Functions

Alkali rain pools and vernal pools are the primary types of wetland features with high-value aquatic functions on Madera Ranch. These wetlands support habitat for several fairy shrimp species. Seasonal wetlands also occur on site, and these are a result of the application of carriage water (surplus water from MID's water deliveries) to and transportation of groundwater across the site over time. Swales contribute to aquatic function on site. They are vegetated with annual grassland plant species, and, except for vernal pool inclusions, lack the soil and vegetative characteristics of permanent or seasonal wetlands.

2.3.3 Habitat Types and Vegetation

Habitat types on Madera Ranch include vernal pools, alkali rain pools, seasonal wetland, canals, California annual grassland, alkali grassland, Great Valley iodine scrub, and cultivated land (Table 1). Specific vegetative species for each habitat type are described in detail in the wetland delineation (ICF Jones & Stokes 2009).

Table 1. Plant Communities on Madera Ranch

Community	Approximate Size in Acres
California annual grassland*	6,462
Alkali grassland	4,044
Vernal pool	22
Great Valley iodine brush scrub	292
Freshwater marsh	2
Alkali rain pool	16
Riparian woodland	2
Cultivated lands	2,745
Pond	2
Other Land-Cover Types:	
Cottonwood Creek (Canal)	4
Gravelly Ford Canal	33
Ranching facilities	22
Total	**13,618**

* Includes 153 acres of grassland that periodically becomes seasonal wetlands.

2.3.4 Hydrology

Overbank flooding of the entire Madera Ranch is rare because upstream reservoirs, levees, and water diversions protect the surrounding areas. Several areas, including portions of Section 2 and Sections 14 and 15, have received regular agricultural carriage water. Seasonal wetlands form in these areas and vary in size and duration with the magnitude of water sent to the Ranch. Groundwater levels are approximately 100 feet below ground surface. Overall, site conditions

indicate that wetland hydrology on the site is primarily received from precipitation and runoff from one part of the site to another, not by flooding or subirrigation.

2.3.5 Topography

Madera Ranch slopes gently from east to west; its elevation ranges from about 215 feet at the eastern edge to about 175 feet at the western edge. The site undulates gently; numerous shallow swales traverse Madera Ranch and generally run from northeast to southwest.

2.3.6 Soils/Substrate

Madera County soils, including those within the study area, were mapped by the U.S. Department of Agriculture Soil Conservation Service (Stromberg 1951). Most of Madera Ranch is used for livestock grazing and has not been cultivated or disturbed by large-scale earthwork activities. Thus, the Madera County soil survey is thought to generally characterize existing soil conditions in most of the ranch. The soil survey indicates that 25 soil map units occur within Madera Ranch. The map units are composed of soils from 11 soil series, all of which formed from granitic and mixed rock alluvium from the nearby Sierra Nevada and exist on two main types of landforms: shallow, nearly level to gently sloping swale-like depressions, and nearly level interswale areas. Soils in swale-like depressions formed in relatively recent alluvium and are mapped primarily as different phases of the Pachappa series. Soils of the Borden, Cajon, Chino, Calhi, Greenfield, and Hanford series are found in swale-like depressions as well, but they occupy considerably less land area. Soils in interswale areas formed from older alluvium and are mapped primarily as different phases and/or complexes of the Fresno and El Peco series. Soils of the Dinuba and Traver series are also found in interswale areas, but they occupy much less land area. These are described in detail in the wetland delineation (ICF Jones & Stokes 2009). Extensive additional subsurface soil sampling has occurred on site to determine subsurface soil properties. Most recently Vollmar Consulting evaluated soils for proposed vernal pool creation locations, identifying sites with the most suitable soils (Vollmar 2011).

2.3.7 Threatened/Endangered Species

Threatened and endangered species occurring (denoted with an *) and potentially occurring on site include:

- vernal pool fairy shrimp* (federally threatened)
- vernal pool tadpole shrimp (federally endangered)
- Conservancy fairy shrimp (federally endangered)
- California tiger salamander (federally threatened, state threatened)
- blunt-nosed leopard lizard* (federally endangered, state endangered and fully protected)
- Swainson's hawk* (state threatened)
- Fresno kangaroo rat (federally endangered, state endangered)
- San Joaquin kit fox (federally endangered, state endangered)
- palmate-bracted bird's beak (federally endangered, state endangered)
- Greene's tuctoria (federally endangered, state rare)

These and other special-status species that occur, or could occur on site, are discussed later in the Mitigation and Management Plan.

2.3.8 Project Effects

Project related effects to land cover are illustrated in Table 2. Phase 1 work would be completed by 2012 with Phase 2 work being phased in over the next 5 years. MID's environmental commitments associated with the project are provided in Appendix A.

Table 2. Effects of Proposed Project on Madera Ranch Habitats

		Temporary Effects				Permanent Effects				Total	
Reduced Alternative B	**Flooding Swales**	**Phase 1**	**Phase 2 (West)**	**Phase 2 (East)**	**Total**	**Phase 1**	**Phase 2 (West)**	**Phase 2 (East)**	**Total**	**Land-Cover**	**No Anticipated Effects**
California annual grassland*	**508**	27	103	62	**192.0**	35	229	132	**396**	6,462	5,366
Alkali grassland	**30**	15	3	62	**80.1**	5	3	34	**42**	4,044	3,892
Vernal pool	**1.3**	0.2	0	0	**0.2**	0	0	0	**0**	22	20.5
Great Valley	**10**	0	0	0	**0.0**	0	0	0	**0**	292	282
Freshwater marsh		0.1	0	0	**0.1**	2	0	0	**2**	2	0
Alkali rain pool	**0.4**	0.6	0	0	**0.6**	1.8	0	0	**1.8**	16	13.2
Riparian woodland		0	0	0	**0.0**	0	0	0	**0**	2	2
Cultivated lands		70	0	0	**70.0**	60	0	0	**60**	2,745	2,615
Pond		0	0	0	**0.0**	0	0	0	**0**	2	2
Total	**549.7**	**113**	**106**	**124**	**342.9**	**104**	**232**	**165**	**501**	**13,587**	**12,193.0**

* Approximately 150 acres of these grasslands become seasonal wetlands due to carrige water or banked water.

3 Land Ownership and Management

3.1 Madera Irrigation District

MID owns 10,946 acres of Madera Ranch. This fee-simple ownership includes all surface and subsurface rights, as well as a 25% or 48.3% ownership interest in the mineral rights. A portion of these lands will be dedicated to a conservation easement holder and maintained in perpetuity as mitigation for the proposed WSEP. These mitigation areas are illustrated in Figure 3, with land-cover acreages in Table 3, and will be phased as the project is phased.

Management of the site to date has been limited to grazing, fence maintenance, canal maintenance, and wetted area monitoring. Ad-hoc control of coyotes has also occurred. Future management of the site will focus on the construction, operation, and maintenance of water banking facilities, and implementation of this Mitigation and Management Plan.

Table 3. Plant Communities on Madera Ranch within Mitigation Areas

	Mitigation Areas			
Community	**Area 1**	**Area 2**	**Area 3**	**Total**
California annual grassland	672	874	1,572	3,118
Alkali grassland	593	151	1,570	2,314
Vernal pool	11.91	0.68	1.86	14.45
Alkali rain pool	2.34	2.15	7.97	12.46
Great Valley iodine scrub	0.0	0.0	291	291
Gravelly Ford Canal	0.0	0.0	13	13
Cultivated lands (to be restored)	50			50
Total	**1,329.5**	**1,027.6**	**3,455.8**	**5,812.9**

3.2 Grazing Lessees

MID leases the annual grasslands to a single tenant cattleman named Mike Urrutia. Mr. Urrutia has run cattle on the property for 25 years since 1986. The lease with Mr. Urrutia is set to expire at the end of 2011. Grazing is an important component of this plan and a desired continued use for the property.

Madera Ranch is equipped with all necessary livestock infrastructure. Perimeter fencing at Madera Ranch is in good condition and there are 20-30 miles of functional cross fencing, typically along Section lines. Gates throughout Madera Ranch are operational. A domestic well at the center of the ranch supplies water to at least one functional water trough in each Section of the ranch. There is a corral and cattle staging area in Section 16.

Mr. Urrutia is responsible for the maintenance of internal fences and watering facilities. He has one staff person who lives onsite and facilitates the ranching operation. Livestock maintenance personnel conduct their ranching activities throughout the property by vehicle, ATV, and horse. Several times a year a medium-sized or larger livestock transport truck accesses the corral. Hereafter, he will be referred to as the Livestock Operator.

Depending on the duration and performance of the lease, the Livestock Operator may change over time. The Livestock Operator, whether Mr. Urrutia, or another operator, will be required to implementing the grazing consistent with the terms of this Mitigation and Management Plan. It should also be noted that other ungulates such as goats may be grazed on site depending on the management goals and objectives. The selection of the future lessee will be based on the lessee's willingness to implement the terms of the grazing prescription, cooperation with MID and the conservation land manager, and willingness and ability to manage the mitigation area to benefit wetlands and endangered species.

3.3 Grimmway Farms

Grimmway Farms is the current landowner of the agricultural lands in Section 1, 4, 13, 14, 16, 21 and 22. All access to the central portions of the ranch, including Sections 16, 21 and 22 occur via dirt access roads in Sections 14 and 15 to the north and between Sections 28 and 29 to the south.

Grimmway installed and maintains a perimeter fence 400 feet from all agricultural lands because of agricultural food and safety production requirements. Grimmway will maintain their fences on an intermittent basis as needed. If undesirable weeds are detected in the fenced areas, Grimmway will treat these infestations (subject to the management obligations in this report); weeds within the fences within the mitigation areas will be managed by the conservation land manager. Other management actions may occur periodically as needed including road maintenance, ditch maintenance, and water pipeline installation.

3.4 Conservation Easement Holder

MID will record a conservation easement on its mitigation lands as the project is phased, with the initial easement being placed in Mitigation Area 1 and Mitigation Area 2 for Phase 1 activities and a portion of Phase 2 activities including wells, pipelines and ponds constructed west of Gravelly Ford Canal. Mitigation Area 3 will be placed under easement when the remainder of the ponds east of Gravelly Ford Canal are constructed. The conservation easement holder will be the California Rangeland Trust (CRT). CRT's mission is to conserve the open space, natural habitat and stewardship of California's ranches. The management of the mitigation area will be fulfilled in accordance with this Mitigation and Management Plan. The National Fish and Wildlife Foundation (NFWF) will disperse annual operating and capital funding to CRT, in accordance with a DFG approved recipient agreement.

3.5 Conservation Land Manager

The conservation easement holder will contract with a conservation land manager to collect site specific data on grazing levels, species occurrence, and habitat conditions on the mitigation lands and assist MID and CRT with enforcing the terms of the conservation easement.

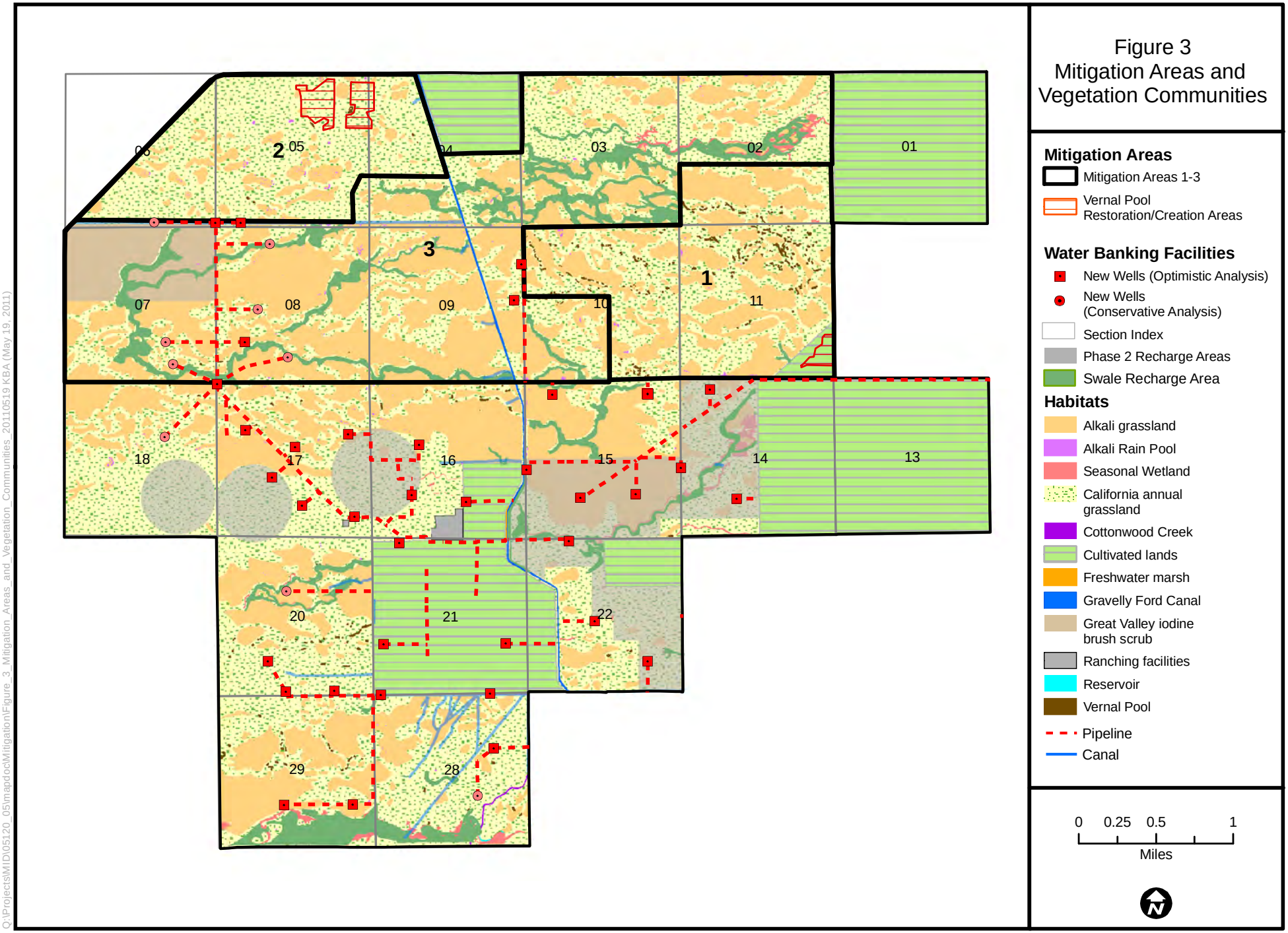
Figure 3
Mitigation Areas and
Vegetation Communities
Mitigation Areas
Mitigation Areas 1-3
Vernal Pool
Restoration/Creation Areas
Water Banking Facilities
New Wells (Optimistic Analysis)
New Wells
(Conservative Analysis)
Section Index
Phase 2 Recharge Areas
Swale Recharge Area
Habitats
Alkali grassland
Alkali Rain Pool
Seasonal Wetland
California annual
grassland
Cottonwood Creek
Cultivated lands
Freshwater marsh
Gravelly Ford Canal
Great Valley iodine
brush scrub
Ranching facilities
Reservoir
Vernal Pool
Pipeline
Canal
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Miles
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4 Overall Management Approach

MID's overall approach is to manage Madera Ranch to achieve water banking, cattle production, and endangered species habitat (including mitigation) objectives. This Mitigation and Management Plan describes two distinct management units, mitigation lands and non-mitigation lands, though the property will be managed with the overall intent of achieving multiple objectives.

Mitigation lands will be managed with the express purpose of species protection and enhancement. Mitigation lands in Area 1 and Area 2 are those areas where prescriptive and regimented practices will occur; these areas are managed with the purpose of benefiting endangered species and will include grazing. Vernal pool creation/reestablishment also will occur on a portion of Area 1 and Area 2. Water banking and grazing will occur in Mitigation Area 3, and swales used for banking and facilities needed for banking will not count toward the mitigation area totals. Additionally, MID will seasonally restrict the banking of water in a portion of Mitigation Area 3, west of Gravelly Ford Canal in Sections 4, 7, 8 and 9, to between October 15 and May 1 to more closely match the existing hydrograph.

Non-mitigation lands are those areas where less prescriptive and regimented management practices will occur; these areas are managed with the primary purpose of banking water, with continued grazing, avoidance measures, and habitat maintenance for endangered species. Invasive weeds will also be identified and controlled to minimize the potential for spread to the mitigation areas.

5 Goals and Objectives of the Mitigation and Management Plan

The goals and objectives described in Table 4 are intended to ensure that the overall management goals and objectives are achieved. MID's environmental commitments associated with the project are provided in Appendix A.

Table 4. Goals and Objectives of the Mitigation and Management Plan

Resource Area/Goal	Objective	Implementation
Water Banking		
Operate and Maintain Water Banking Facilities to Maximize Infiltration and Extraction	Achieve percolation rates of 0.5 ft/day or better.	Monitored by MROC.
	Bank 55,000 af of water per year when available.	Regulated by MROC.
	Extract 55,000 af of water when needed.	Regulated by MROC.
	Ensure water banking does not encroach on Mitigation Area 1 and Mitigation Area 2.	MID, CRT, and Conservation land manager.
	Ensure water banking is restricted to October 15 to May 15 in Sections 7, 8 and 9 of Mitigation Area 3.	MID, CRT, and Conservation land manager.
Natural Communities and Species		
Minimize Potential Project Effects on Endangered Species	Survey facility alignments prior to construction.	Regulated by project Biological Opinion and State Incidental Take Permit.
	Survey mitigation areas every year for the first 5 years and every 5 year thereafter to assess habitat conditions and evaluate species presence.	Conservation land manager.
Maintain High-Quality Upland Habitat	Place a conservation easement on a Area 1 for Phase 1, Area 2 for Phase 2 (facilities and west ponds), and Area 3 for Phase 2 (east ponds), and manage the mitigation areas to support endangered species.	MID to record conservation easements with County in the name of CRT, with DFG as a third party easement beneficiary and provide a non-wasting endowment to NFWF to fund habitat management in perpetuity.
	Ensure that no more than 550 acres of wetted area occurs.	Area of inundation surveys described later in the Mitigation and Management Plan.
	Avoid and control invasive plants.	Review the site annually for invasive plants; if necessary map invasive plant infestations and develop and implement control strategy.

Resource Area/Goal	Objective	Implementation
	Conduct regular vegetation surveys.	Transects will be 20 meters long, marked in the field with rebar, and mapped using high-resolution GPS. Species percent cover will be measured using the quadrat method. A 20-meter tape will be stretched along the transect, and a 0.5 × 0.5-meter (0.25 square-meter) quadrat will be placed with the lower corner at 10 and 15 meters along the right side of the tape, and at 5, 10 and 15 meters along the left side of the tape. The percent cover (on a modified Daubenmire cover class scale of <1, 1 to 5, 5 to 25, 25 to 50, 50 to 75, 75 to 95, and >95% absolute cover) of each plant species within the quadrat will be recorded.
	Maintain or increase native plant populations.	Manage invasive plants with multiple treatment approaches.
	Manage to protect listed terrestrial species and wetland resources.	Maintain or reduce occurrences of significant new infestations or significant expansion of existing infestations of high-priority pest plants (as detected in annual or every 5th year botanical survey).
Ensure No Net Loss of Sensitive Wetland Habitat	Create/restore vernal pools at a 2:1 ratio and preserve vernal pools at a 3:1 ratio in the Madera Ranch watershed (this consists of 7 acres of creation/reestablishment and 10.5 acres of vernal pool preservation). (Higher preservation ratios may lower the creation ratio.)	MID to contract with appropriately skilled restoration designer to create/restore vernal pools on site. MID to ensure the conservation easement includes the restoration area and other areas with sensitive wetlands within the mitigation areas.
Grazing		
Maintain rangeland ecosystem health, sustainable livestock operation (in mitigation lands and to degree possible other lands)	Maintain grassland herbaceous height to benefit special status natural communities, plants and animals; maintain heterogeneity of herbaceous height.	Maintain 2 to 12 inches mean herbaceous foliage height year-long, preferably closer to 2 inches.
	Maintain grassland herbaceous height, mass (Residual Dry Matter--RDM), and cover to benefit biodiversity generally; and to limit fire hazards to a low level.	Maintain at least ≥ 300 lbs/acre RDM on 40% of the conservation lands and 600 lbs/acre minimum mean autumn RDM on 60 % of the conservation lands for a mosaic of shrub and grassland habitat types; ≥70% absolute foliar cover.

Resource Area/Goal	Objective	Implementation
	Maintain or increase native plant populations by reducing non-native herbaceous competition in grasslands, wetlands, and riparian areas.	Maintain at least ≥ 300 lbs/acre minimum mean RDM on 40% of the conservation property acreage and ≥ 600 lbs/acre minimum mean RDM on 60% of the conservation property acreage in December to facilitate a mosaic of shrub scrub grassland habitat; ≥70% absolute foliar cover, plus: maintenance of populations of native grasses and wetland plants (a qualified botanist will conduct botanical surveys in the mitigation area annually for the first 5 years and every 5th year). No more than 10% of the total conservation property below the minimum 300 lbs/acre RDM at any given time. RDM will be sampled in late fall just before the first precipitation event that is expected to result in germination (late October or early November). RDM will be determined by ten (10) monitoring locations for each 1,000 acres. Five (5) of the ten (10) will be permanent transects and of those five (5), two (2) will be for the purposes of clipping and weighing RDM inside of a 0.94 foot diameter sampling hoop. The remaining eight (8) will be sampled using a 0.94 foot diameter sampling hoop to estimate % cover. Grazing will occur from November 1 through June 1 with adjustments in stocking rates and duration based on the RDM sampling rates, precipitation, and invasive species management needs. The goal of grazing is to reach a lowest RDM of 600 lbs/acre over 60% of the mitigation lands in late December. Manage invasive plants with multiple treatment approaches.

Resource Area/Goal	Objective	Implementation
	Avoid and control the introduction and expansion of invasive non-native pest plants and animals.	Maintain or reduce occurrences of significant new infestations or significant expansion of existing infestations of high-priority pest plants (as detected in annual or every 5th year botanical survey).
	Control soil erosion at priority sites where current management is contributing to significant sediment movement, where erosion is active, and if controls are feasible.	Maintain or reduce occurrences of significant new erosion sites or significant expansions of existing sites as detected during grassland measurements.
	Maintain adequate condition of the grazing infrastructure to support the livestock grazing operation, including fencing to prevent cattle escape through the perimeter fencing.	Maintain or reduce occurrences of significant degradation of the perimeter and internal fencing, gates and staging area, maintenance access roads, and watering facilities.
	Conduct annual meetings between MID and grazing operator to discuss livestock management.	Conduct annually
	Maintain grazing infrastructure.	As fences and watering troughs need repair, install "wildlife friendly" fences and watering troughs.
	Move livestock from the mitigation area or modify intensity as requested by CRT, the conservation land manager, MID or MID's designee.	As needed.

6 Land Management Activities

6.1 Access and Trespass/Illegal Uses/Signage

MID will regulate access to Madera Ranch with gates. Users allowed to enter the property will be MID staff, MID contractors, grazing lessee staff or contractors, Grimmway staff or contractors, conservation easement holder and assignees, and other individuals and organizations approved by MID. Illegal uses will be prohibited. Signage will be placed on the perimeter, or nearest fenced portion, of the mitigation area and will indicate the mitigation lands are to be managed for wetland and wildlife habitat in perpetuity. The permitting agencies, U.S. Fish and Wildlife Service (USFWS), California Department of Fish and Game (DFG), Corps, U.S. Bureau of Reclamation (Reclamation), shall have access to the site. Access can be obtained by contacting MID's general manager, CRT, or the conservation land manager and arranging the logistics.

6.2 Agricultural Conversion

Mitigation lands will be protected by conservation easement in perpetuity. MID does not intend to convert remaining Madera Ranch lands to intensive or cultivated agricultural uses, without seeking appropriate local, state, or federal permits.

6.3 Alteration of Watercourses

Any alteration of waterways or wetlands shall need prior authorization from the Corps. MID will avoid application of water into swales for banking purposes in Mitigation Areas 1 and 2. No earth-moving activity will occur in mitigation areas beside initial Section 8 northern canal construction and vernal pool creation activities in designated areas. Downstream wetlands will be monitored to ensure direct and indirect effects are minimized (see Species Monitoring and Management). MID will limit its alteration of swale water courses throughout the property. Minor earth-moving and berm establishment may be employed to control banking, but should be done to avoid adverse effects to listed species and aquatic resources. Swale banking operations will be constrained through the creation of rating curves and seasonally restricted in a portion of Mitigation Area 3, west of Gravelly Ford Canal in Sections 4, 7, 8 and 9, to between October 15 and May 15, and monitored by MID with reports to the conservation easement holder.

6.4 Chemicals

Chemical usage relates to the potential use of herbicides, pesticides, fungicides, rodenticides or other human made chemicals. In mitigation lands, chemical use will be highly restricted and the type of chemical, timing, and duration of use are subject to USFWS and DFG approval. Potential use of herbicides, pesticides, fungicides will only be used to treat infestations of noxious weeds or outbreaks of damaging insects if deemed absolutely necessary by the conservation land manager and approved for use by USFWS and DFG. The terms of the Conservation Easement will also restrict chemical use on mitigation lands. Rodenticides will not be used on mitigation lands. Vehicle maintenance will not occur on mitigation lands.

In non-mitigation lands use of these chemicals will also be minimized. In both areas, chemical usage will be applied in compliance with federal and state standards.

6.5 Dumping

No dumping of solid waste, biosolid waste, or other materials will be allowed on the mitigation and non-mitigation lands.

6.6 Emergency Vehicle Access

Emergency vehicle access will be allowed throughout the property as needed, but will be encouraged to use existing access roads. A post-emergency habitat assessment must occur in areas where emergency vehicles accessing mitigation lands to determine if the habitat has been degraded and restoration is merited due to the incident. If earth moving activities are conducted within waters of the United States, the Corps should be notified immediately. A post-emergency assessment will be sent to the permitting agencies within two weeks of an incident.

6.7 Grazing

Grazing is an allowable use in mitigation and non-mitigation lands. Grazing in mitigation lands will be more prescriptive to allow for improved management of habitat for endangered species.

6.8 Hunting

No hunting is allowed on mitigation lands. Hunting is allowable on non-mitigation lands subject to MID's approval and state fish and game code.

6.9 Maintenance and Repair

No vehicle maintenance and repair will occur within mitigation lands. Maintenance and repair of fences, watering troughs and pipes to watering troughs, and Section 8 Canal north lateral is allowed. There are no restrictions on maintenance and repair on non-mitigation lands, though vehicle maintenance is generally not expected to occur on the Ranch.

6.10 Natural Resource Development

No natural resource development (i.e., aggregate, gas, or oil) will occur on mitigation lands. MID does not intend to and will not use non-mitigation lands to for natural resource development purposes.

6.11 Pest Management

In mitigation lands, chemical use will be highly restricted. Potential use of herbicides, pesticides, fungicides will only be used to treat infestations of noxious weeds or outbreaks of damaging insects with the written concurrence of the resource agencies.

6.12 Recreational Activities

Recreational activities including, but not limited to, horseback riding, biking, and hunting are precluded on mitigation lands. Passive recreation such as bird watching is allowed provided it does not interfere with the primary management objectives.

6.13 Roads

Construction of new roads within the mitigation lands is prohibited. New road development could occur on non-mitigation lands consistent with other state and federal laws.

6.14 Structures

After construction of the Section 8 Canal northwest extension, the construction of new structures will be prohibited within mitigation lands. New structures could be built on non-mitigation lands consistent with other state and federal laws.

6.15 Vehicles

Vehicle use will be minimized within mitigation lands. However, some vehicle access will still be required to support grazing, water banking, and species and habitat monitoring activities. Vehicle access should occur during the dry season to the extent possible and vehicles should stay on dirt roads to the extent possible. Recreational ATV use is prohibited in the mitigation area, but ATV use for grazing operations is allowable provided speeds are less than 20 miles per hour and do not damage the natural vegetation.

7 Grazing Management

This plan recommends modifications from the most recent grazing practices in the mitigation area to focus on and improve achievement of the objectives and performance standards listed earlier. The non-mitigation lands will have fewer restrictions and grazing will continue year-round.

This section describes the circumstances needed to achieve the conservation objectives and to sustain a livestock production enterprise needed to use cattle grazing as a well-functioning and flexible conservation management tool. It defines specific grazing management actions to achieve the objectives and performance standards, and a monitoring plan to ensure those actions are effective.

The intent of this plan is to utilize grazing to optimize herbaceous height, mass, and cover, which are the primary characteristics of the grassland ecosystem that affect soil stability and erosion potential as well as the habitat quality for the special plants and animals. The grazing capacity assessment provides the baseline for expected herbaceous forage available to graze and the appropriate stocking rates for each grazing management unit (GMU) under normal, wetter, and drier precipitation conditions (see “Capacity Assessment” below).

Critical to the development and maintenance of a successful grazing management program at Madera Ranch will be the cooperation of the Livestock Operator. To achieve the greatest degree of cooperation, flexibility, efficiency, and conservation benefits, the Livestock Operator should be given responsibility for developing implementation plans, conducting appropriate monitoring activities, assessing management problems and potential solutions, and making adjustments to the original plan in consultation with MID and the permitting agencies. The following specifications should be regarded as guidelines for implementation by the Livestock Operator and MID, and for evaluation of their management practices. For example, the number of animals grazed in any month will be flexible to allow decisions about additions or subtractions to the stocking rate during the grazing period to meet the objectives and performance standards (based on weather predictions, actual forage available, and periodic monitoring), and to allow a feasible grazing operation.

Annual planning for grazing during the coming year will commence in June, and following receipt of all monitoring reports (see “Monitoring Reports” below). Annual planning will be initiated by preparation of a brief summary letter from the Livestock Operator to MID that briefly describes the following plan components:

- Proposed schedule of approximate month-to-month stocking rates for each GMU with Animal Unit (AU) equivalence calculations and a summary of justifications;
- Observations of significant grazing management circumstances during the previous year;

- Assessment of the results of monitoring the previous year;
- Contingency actions for predicted extreme weather circumstances, such as drought or excessive precipitation for the coming year;
- Recommendations for maintenance and improvements to infrastructure, and other needed measures to achieve the stated objectives and performance standards;
- Explanation of any adaptations of the grazing specifications from those described in this document.

The permitting agencies will be kept apprised of contact information for the current Livestock Operator and will be notified if there is a change in operators. Grazing practices must be consistent with species and wetland conservation objectives. If these objectives are not met, MID, CRT, and the conservation land manager will direct the Livestock Operator to modify their practices. This could include adding or removing livestock during the current grazing season, or modifying stocking rates during the following season, as set forth in the amended plan.

7.1 Summary of Ecosystem Conditions Affected by Grazing

The following sensitive plant communities were considered in the grazing analysis: Great Valley iodine brush scrub, alkali grassland, vernal pools, alkali rain pools, and seasonal wetland.

Annual grassland, alkali grassland, vernal pools, and alkali rain pools occur inside the mitigation area. Other special plant community types occur outside the mitigation area. Five sensitive communities are discussed here because of concerns about the effects of grazing management. Each community would benefit from special management and monitoring, particularly where reproduction and persistence have been insufficient to maintain all the component native species and healthy functions. See Figure 3 for a map of the vegetation communities.

7.1.1 Great Valley Iodine Bush Scrub

Great Valley iodine bush scrub occurs in patches on nearly 300 acres in the northern half of Section 7. Stand numbers have been declining since approximately 2002. During an April 2007 site visit, vegetation in this plant community was typically less than 1-foot tall, possibly due to heavy grazing. No information on palatability or forage value of the dominant species, iodine bush (*Allenrolfea occidentalis*), was found. This plant community also contains alkali sacaton and saltgrass. Alkali sacaton is fair to good forage for cattle and can tolerate moderate grazing (Stubbendieck et al. 1997; FEIS 2009). Saltgrass is poor quality forage, but will be consumed, especially during late summer, when livestock do not have access to other preferred forage. Additionally, the perennial, rusty molly (*Kochia californica*) can be found in the Great Valley iodine bush scrub. While no information was found on palatability of rusty molly, *K. americana,* also a perennial, is an excellent forage for cattle (Stubbendieck et al. 1997; FEIS 2009). *K. scoparia*, an annual, can be toxic to livestock, but nevertheless, is good forage and is preferred by cattle, especially when the plant is young. Therefore, *K. californica* has the potential to be utilized by livestock. It is believed reduced grazing pressure and periodic swale wetting in Section 7 will foster additional growth of iodine bush.

7.1.2 Alkali Grasslands

Alkali grasslands covers over 4,000 acres at Madera Ranch and supports typical California annual grassland species. In addition, a host of perennial and halophytic species are common to these

grasslands, including two perennial grasses, alkali sacaton (*Sporobolus airoides*) and saltgrass (*Distichlis spicata*). Alkali sacaton is fair to good forage for cattle and can tolerate moderate grazing (Stubbendieck et al. 1997; FEIS 2009). Saltgrass is poor quality forage, but will be consumed, especially during late summer, when livestock do not have access to other preferred forage. *Atriplex* sp. are associated with the alkali soils at Madera Ranch and might be winter forage for livestock, as are other species of *Atriplex*. As such they could be vulnerable to excess herbivory and trampling, especially during the dormancy and seedling establishment seasons. Alkali peppergrass (*Lepidium dictyotum*) also occurs in the alkali grasslands. No information was found on palatability of alkali peppergrass; however, a related species not found on site, perennial pepperweed (*Lepidium latifolium*), is not a preferred forage. Cattle are known to graze perennial pepperweed rosette leaves or flower stalks if the stand is not dense.

Properly timed grazing can be used to suppress non-native herbaceous competition with native plants, and can favor native grasses. The density and vigor of native perennial grasses can be improved when intensive spring grazing is curtailed just before the existing native perennial grasses re-grow, flower, and set seed (Menke 1992). This specialized grazing removes much of the density and mass of the non-native annual grasses through their growing season, which is shorter than for the native perennial grasses. Curtailing grazing at that time simultaneously allows the native perennial grasses to grow, flower, and set seed before the soil moisture is exhausted. Other research has shown mixed results, and suggests caution in grazing prescriptions to favor native grasses. A study at Jepson Prairie by Dyer, Fossum, and Menke (1996) found that grazing was not effective to increase purple needlegrass (*Nassella pulchra*), and that climate is the more influential factor. Hatch et al. (1999) suggest that different native grasses and forbs have different and sometimes conflicting responses to management, and therefore more research is needed to guide grazing and burning practices. In a study of coastal prairie, Hayes and Holl (2003) found that native grasses were not more abundant where grazed than where ungrazed. However they found native forbs were more abundant where grazed due the suppression of non-native herbaceous competition and build-up of thatch. Spring and summer wildflowers of grasslands are typically showier where grazing has occurred (Edwards 1992).

Grazing in the mitigation areas should focus on the potential to improve existing stands of native grasses, and to focus on reduction of the non-native herbaceous competition in a heterogeneous pattern—some patches grazed more and some less. This type of grazing favors a diversity of conditions, including those more favorable to expansion and persistence of native grasses (Fuhlendorf and Engle 2001). Extensive grazing of large pastures with the livestock dispersed for the entire grazing period will be more effective at producing such heterogeneity than would higher intensity rotational grazing of smaller pastures. The grazing prescription described later in this document will generally benefit the native grass populations.

7.1.3 Vernal Pools and Alkali Rain Pools

Vernal pools are seasonally inundated wetlands that occur in depressions on poorly drained soils. The pools are usually surrounded by non-native annual grassland, but the pools themselves support endemic plants that emerge and flower in concentric rings associated with the filling then drying of the pool in the late spring and summer. Approximately 41 acres of vernal pools and alkali rain pools occur at Madera Ranch. Vernal pools, at Madera Ranch, occur in annual grassland swales, typically on Pachappa soils, and support vernal pool fairy shrimp. Alkali Rain pools, a type of vernal pool, occur in slickspots where ponded water remains for extended periods of time. Recent research has shown that grazing exclusion from formerly grazed vernal pools in California leads to dominance of

non-native grasses at the pool edges and bottoms, displacement of native species, and that pool water depth reduction and drying proceeds more quickly and sporadically during the spring where non-native grasses dominate the pools (Marty 2004; Robins and Vollmar 2002). This shortened inundation period can be detrimental to native special-status wildlife. Grazing can be used as a tool to prevent the dominance of non-native grasses from vernal pool edges, and thus to improve habitat quality and abundance of pool edge native plants. Grazing should not be removed from vernal pool systems, and can play an important role in vernal pool conservation if managed properly (Robins and Vollmar 2002). In one of the only scientific studies of different grazing treatments in vernal pools of California, Marty (2005) found that continuous grazing benefited the habitat of native plants and reduced non-native grasses more effectively than seasonal grazing and exclusion of grazing. Grazing should be applied during the seasons of grass growth at the vernal pools (extends later than at the surrounding uplands), and before native seedling emergence in the fall. Grazing will be managed to increase the viability of the vernal pools.

7.1.4 Riparian Woodland and Freshwater Marsh

There is very limited riparian woodland and freshwater marsh on Madera Ranch. Riparian woodland occurs at the edge of a pond in the southeastern portion of Section 28. Freshwater marsh have evolved due to atypical agricultural or high-water year spills and are found in Section 2 and in Section 28 and 29. The area in Section 28 is related to a stock pond and no management actions are currently proposed for this area. There is a small amount in Gravelly Ford Canal near the center of the ranch.

7.1.5 Grazing Management of Special-Status Plant Habitat

Five special-status plants were found at Madera Ranch (J&S 2000 and ICF J&S 2009):

- Heartscale (Atriplex cordulata)
- Lesser saltscale (Atriplex minuscula)
- Subtle orache (Atriplex *subtilis*)
- Recurved larkspur (Delphinium recurvatum)
- Persistent-fruited saltscale (Atriplex persistens)

The mitigation area was surveyed for special-status plants (ICF J&S 2009). Habitat for all 5 special-status plant species is present in the mitigation area and all 5 species likely occur there. All of these species have been documented outside the mitigation area. Refer to Appendix B for the list and special-status designations of each plant with known or potential occurrence at Madera Ranch. Descriptions of the potential effects of livestock grazing were summarized from the best available scientific documents and observations, and provide guidance for management. The habitats of the plants with at least potential occurrence warrant special management where they might be vulnerable to or benefited by livestock grazing, in particular the planned winter and spring grazing. Livestock grazing has the potential to cause negative impacts to the heartscale and recurved larkspur, but only benefits are expected because of a new proposed grazing regime in this area.

In general, the prescription to graze the mitigation area at low stocking density during the growing seasons is expected to avoid harm to the special-status plants (including heartscale and recurved larkspur) due to the relatively higher palatability (and thus selective preference by livestock) of the

green growing grasses, thus reducing the chance that such forbs will be grazed even if they are palatable.

Heartscale and Recurved Larkspur

Little is known about the grazing effects on these two forbs. Heartscale is an annual herb. Multiple perennial species of Atriplex are palatable and considered good forage for livestock, especially during the winter (FEIS 2009, Stubbendieck et al. 1997). No information on grazing palatability was found for heartscale, although CNPS listed grazing as a possible threat (CNPS 2009). However, moderate grazing is not expected to harm this species (Preston personal communication). Grazing has been the dominant land-use of the area for at least the last 23 years (Urrutia personal communication) and this species persists.

Recurved larkspur is a perennial herb. Cattle are known to consume flowers and immature seedpods of Delphinium occidentale, another perennial larkspur, although it is not considered highly palatable (FEIS 2009). *Delphinium bicolor* is palatable to sheep (Stubbendieck et al. 1997), but is toxic to cattle (FEIS 2009). No information was found on palatability of recurved larkspur. However, CNPS listed grazing and trampling as threats to the species (CNPS 2009). Moderate grazing is not expected to harm this species (Preston personal communication). Grazing has been the dominant land-use of the area for at least the last 23 years (Urrutia personal communication) and this species persists.

7.1.6 Grazing Management of Special-Status Animal Habitat

Thirteen special-status animals are likely to occur, and 17 are known to occur at Madera Ranch (J&S 2000; U.S. Bureau of Reclamation 2008a; U.S. Bureau of Reclamation 2008b). Those species of at least potential occurrence at Madera Ranch warrant special management where they might be vulnerable to or benefited by livestock grazing, in particular the planned late winter and spring grazing. Descriptions of the potential effects of livestock grazing were summarized from the best available scientific documents and observations, and provide guidance for management. Livestock grazing has the potential to affect 25 species:

- Vernal Pool fairy shrimp (*Branchinecta lynchi)*
- Conservancy fairy shrimp (*Branchinecta conservatio)*
- San Joaquin tiger beetle (*Cicindela tranquebarica* ssp.)
- Valley Elderberry Longhorn Beetle *(Desmocerus californicus dimorphus)*
- Western Spadefoot (*Spea hammondii)*
- California tiger salamander (*Ambystoma californiense*)
- Blunt-nosed leopard lizard (*Gambelia (=Crotaphytus) sila)*
- Swainson's hawk (*Buteo swainsoni)*
- Mountain plover (*Charadrius montanus)*
- White-tailed kite (*Elanus leucurus)*
- Ferruginous hawk (*Buteo regalis)*
- Long-billed curlew (*Numenius americanus)*

- Western burrowing owl (*Athene cunicularia*)
- Loggerhead shrike (*Lanius ludovicianus)*
- Tricolored blackbird (*Agelaius tricolor*)
- Northern harrier (*Circus cyaneus*)
- Golden eagle (*Aquila chrysaetos)*
- Merlin (*Falco columbarius)*
- Prairie falcon (*Falco mexicanus)*
- Short-eared owl (*Asio flammeus*)
- California horned lark (*Eremophila alpestris actia)*
- San Joaquin pocket mouse (*Perognathus inornatus)*
- Fresno kangaroo rat (*Dipodomys nitratoides exilis)*
- San Joaquin kit fox (*Vulpes macrotus mutica*)
- Nelson's antelope ground squirrel (*Ammospermophilus nelsoni)*

Table 5 indicates which of these 25 species have been documented or could occur in the mitigation area and the non-mitigation area. All but the Valley elderberry longhorn beetle occur or could occur inside the mitigation area. All species occur or could occur in the non-mitigation area. All of the special-status animals found or that are likely to occur at the site would either benefit from or be unaffected by the planned late winter and spring livestock grazing. This plan follows the recommendations of the USFWS, DFG and other experts to adjust livestock grazing so the habitat qualities for the known and potential special-status wildlife are generally benefited and maintained. No negative impacts to any of these species are expected as a result of the planned shift from the existing to the modified grazing management in the mitigation area, and conditions for their conservation are expected to improve.

Table 5. Occurrence of Special-Status Animals at Madera Ranch

Special-Status Animal Species	Documented at Madera Ranch?	Documented or Could Occur in Mitigation Area?	Documented or Could Occur in Non-Mitigation Area?
Vernal pool fairy shrimp	Documented	Yes	Yes
Conservancy fairy shrimp	Could occur	Maybe (unlikely)	Maybe (unlikely)
San Joaquin tiger beetle	Documented	Maybe (likely)	Yes
Valley Elderberry Longhorn Beetle	Could occur	No	Yes (host plant present)
Western spadefoot	Documented	Maybe	Yes
California tiger salamander	Could occur	Maybe	Maybe
Blunt-nosed leopard lizard	Documented	Yes	Yes
Swainson's hawk	Documented	Yes	Yes
Mountain plover	Could occur	Maybe	Maybe
White-tailed kite	Documented	Yes	Yes
Ferruginous hawk	Documented	Maybe	Maybe
Long-billed curlew	Documented	Yes	Yes
Western burrowing owl	Documented	Yes	Yes
Loggerhead shrike	Documented	Yes	Yes
Tricolored blackbird	Documented	Maybe (unlikely)	Maybe (unlikely)
Northern harrier	Documented	Yes	Yes
Golden eagle	Documented	Yes	Yes
Merlin	Documented	Yes	Yes
Prairie falcon	Documented	Yes	Yes
Short-eared owl	Could occur	Maybe	Maybe
California horned lark	Documented	Yes	Yes
San Joaquin pocket mouse	Documented	Maybe (possible)	Yes
Fresno kangaroo rat	Could occur	Maybe (unlikely)	Maybe (unlikely)
San Joaquin kit fox	Could occur	Maybe (possible)	Maybe (possible)
Nelson's antelope ground squirrel	Could occur	Maybe	Maybe

The general habitat requirements and potential effects of livestock grazing on the 25 animals of most concern are beneficial for most of these species and the maintenance of short, sparse grass levels, without invasive species are important.

7.1.7 Invasive Non-Native Pest Plant Control Using Grazing

Invasive plants at Madera Ranch occur in low densities and are not a management concern at this time (Preston personal communication). Existing livestock grazing likely controls invasive plants. However, if vernal pools and swales become inundated more frequently and for longer periods of time as a result of MID's proposed water supply enhancement, then non-native and native wetland plants could become invasive (Preston personal communication; U.S. Bureau of Reclamation 2008a). These species include three non-native species: Pennsylvania smartweed (*Polygonum pensylvanicum*), spotted ladysthumb (*P. persicaria*), and marsh pepper (*P. hydropiper*) and three native species: curlytop knotweed (*P. lapathifolium*), water smartweed (*P. punctatum*), and water pepper (*P. hydropiperoides*)[1]. None of these species are rated by Cal-IPC or CDFA. However, because they may alter vernal pool and swale habitat, they should be monitored. Control methods for similar *Polygonum* species include mowing and increasing drainage (DiTomaso and Healy 2007).

Seventy eight introduced plant species were identified at Madera Ranch (J&S 2000 and ICF J&S 2009). Of those introduced plants, 18 species were rated "high" or "moderate" by Cal-IPC (2006). The nine species with a rating of "high" and all non-grass species with a rating of "moderate" are included here:

- Red brome (Bromus madritensis ssp. rubens)
- Cheat grass (Bromus tectorum)
- Yellow waterweed (Ludwigia sp.)
- Mediterranean mustard (Hirschfeldia incana)
- London rocket (Sisymbrium irio)
- Bull thistle (Cirsium vulgare)
- Yellow star-thistle (Centaurea solstitialis)
- Tocalote (Centaurea melitensis)
- Gum tree (Eucalyptus sp.)

The mitigation area was not assessed during the botanical surveys. All of the species listed here could occur throughout the site, with the exception of gum tree. If swales are inundated with water for long periods of time, yellow waterweed could occur as well (Preston personal communication).

Some of these plants may be partially controlled (but not eliminated) using grazing management, including the targeting of specific stands with short-duration high-intensity grazing encompassed temporarily by portable electric fencing at the time of greatest vulnerability. As an example, tocalote might be controlled by moderate grazing in the late spring and early summer before the plants flower (Thomsen et al. 1996). If early summer grazing is not conducted, tocalote might be more likely to produce flowering stems that grow above the grass in greater abundance than if early summer grazing is conducted. Grazing might also aid in control of red brome. The high stocking densities necessary to achieve the desired impact on target weeds is normally not feasible on landscapes larger than a few hundred acres, such as Madera Ranch, because the need is too extensive and the effort to concentrate grazing is too expensive. However, since Madera Ranch's infestations are currently few and small, such concentrated treatments should be feasible. Specific

[1] Common names for *Polygonum sp.* are from Calflora (2009).

grazing management practices to control the invasive plants noted above are described in Appendix C.

Livestock grazing might cause the spread of tocalote if grazing occurs in the summer. Intensive grazing is thought to contribute to the expansion of cheat grass and red brome. If plant infestations expand, high priority areas of invasive plant infestations that would be vulnerable to a grazing treatment should be identified, and intensive grazing employed there as feasible (alternatively herbicide or other treatment methods may be applied). With the Livestock Operator's cooperation, it might be feasible to collect the equipment for small-scale temporary enclosures using electric fencing, and to assemble cattle periodically for a program of rotation between sites to control the target invasive plant stands. Other methods, particularly manual grubbing, stump cutting, and herbicide applications may be needed to control other invasive plants that are not vulnerable to grazing treatment. Control of new introductions and expansion of these plants can also be minimized by avoiding the creation of bare ground or disturbed soils that are associated with areas of cattle concentration around corrals and supplemental feed stations.

7.1.8 Grazing Management Related to Fire Hazard Reduction

Accumulations of highly flammable herbaceous fuels in annual grasslands are a well-known problem during the dry seasons. In this case, livestock grazing is the preferred alternative, among the common methods of fuel reduction. Mowing is expensive, can spark a wildfire, and is impractical in uneven terrain. Prescribed fire causes smoke pollution, can escape to cause severe damage to property and human health, and is impractical for repeated treating of large areas.

Most grassland managers find the benefit of fire hazard reduction to be the primary incentive to employ grazing on their lands. The risk of direct and indirect damage by wildfire to structures and human health can be severe.

The fire hazard represented by grazeable herbaceous forage is very significant. The Livestock Operator indicated that fires have occurred at Madera Ranch almost every year (Urrutia personal communication). In 2008, embers from a fire on the neighboring almond orchard exploded on to Madera Ranch, burning 120 acres of Section 6. The largest fire at Madera Ranch, within the last 23 years, covered 300–400 acres. The grassland herbaceous fuels would be likely to carry a wildfire very quickly during the dry seasons. Although the herbaceous fuel loads of the grassland fluctuate from year to year associated with weather conditions, the risks posed by these fuels are usually severe most years if not reduced by grazing or other means to low amounts. Regular livestock grazing at Madera Ranch at the stocking rates and times prescribed to utilize most of the available forage by the start of summer will help greatly to reduce the fire hazards. As further precaution, fuel breaks can be maintained in targeted grassland zones with grazing by placing mineral licks there during the grazing period to attract greater livestock use. In the mitigation area, fuel breaks should be maintained through livestock distribution as opposed to disking because disking has a higher potential to harm special-status species.

Formal fire management planning is essential for long-term protection from damages and injury and to integrate it with conservation and personnel access purposes. MID should cooperate with the resource agencies and local fire management authorities to refine fire management plans for Madera Ranch, and conduct fire management activities other than grazing that will reduce the risks of wildfire damage. Based on these discussions a management decision will be made on how to handle fire control in the mitigation areas; it may be that fires are allowed to burn in these areas. It

is important to note that the use of mowing or controlled burning to manage vegetation are important tools if ecological goals are not achieved with grazing alone. Controlled burning is a proven method for eliminating accumulated plant matter and also serves to reduce cover of non-native annual grasses. While prescribed burning is an effective tool in the long-term management of thatch accumulation (DiTomaso et al. 1999, Tu et al. 2001), the Madera Ranch currently uses cattle grazing to manage thatch build-up. Due to environmental restrictions and the potential risks of prescribed burns (escape, damage to property and people), burning as a method to control vegetation and thatch accumulation shall be considered only if ecological goals are not achieved with grazing and shall be used only with the approval of DFG, USFWS, California Department of Forestry and Fire Protection (CALFIRE), and California Air Resources Board (CARB).

7.1.9 Summary of Management Requirements of Ecosystem Components Related to Grazing

Table 6 summarizes the timing of the potential grazing effects on Madera Ranch's special resources and associated management concerns discussed above. The table shows when grazing would have more or fewer effects, and the best times to apply grazing. The "+" indicates months when grazing could be beneficial to the resource; the "-" indicates months when the grazing could be detrimental to the resource. Grazing during all periods of time pose some tradeoffs in positive and negative effects. However, grazing applied between January and May would maximize the benefits of reduced mass and height of the annual grasses and forbs, and minimize the adverse effects of grazing during the wet season. Grazing before February poses significant risks of soil erosion during above-normal weather years. Grazing after May poses risks to establishment of woody species in the riparian and wetlands. Potential conflicts with spring grazing include the protection of spring flowering special-status plants, natural communities, and animals, but these communities and species would also benefit from the reduced mass and height of the annual grasses and forbs at that time.

Table 6. Timing of the Potential Effects of Grazing on Vulnerable Special Resources

Special Resource	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Management Concerns
Soil Erosion			–	–	–	–	–						Soil surfaces are most sensitive to hoof traffic during wet seasons
Water Quality				–	–	–	–	–	–				Seasons of precipitation and greatest stream/canal flows; sensitivity of waters to pollution
Spring Flowering Special-Status Plants							–	–	–				Spring flowering special-status plants might be more vulnerable to damage to their flowering stems, flowers, and seed production during the flowering season
				+	+	+	+	+	+				Competition from non-natives reduced and natives favored by grazing
Summer Flowering Special-Status Plants										–	–	–	Summer flowering special-status plants might be more vulnerable to damage to their flowering stems, flowers, and seed production during the flowering season
				+	+	+	+	+	+				Competition from non-natives reduced and natives favored by grazing
Great Valley Iodine Brush Scrub										–	–	–	Perennial grasses and scrub vulnerable to summer grazing
Alkali Grassland		–	–					–	–	–			Protect *Atriplex* sp. from excess herbivory and trampling during dormancy and seedling establishment seasons (unconfirmed estimates)
						+	+	+	+				Competition from non-natives reduced and native grass reproduction favored by grazing (this is not usually a problem for *Atriplex* because it grows in soils where annual grasses do not occur)
Vernal Pools/Alkali Rain Pools			–	–	–	–							Native plants and pool banks sensitive to winter grazing
						+	+	+	+	+	+	+	Competition from non-natives reduced and natives favored by grazing

Special Resource	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Management Concerns
Riparian Woodlands and Freshwater Marsh	–	–								–	–	–	Riparian and freshwater marsh woody seedlings and herbaceous plants sensitive to hoof traffic and excess herbivory
						+	+	+	+				Competition from non-natives reduced and natives favored by grazing; herbaceous plant diversity increases with moderate grazing
Vernal Pool Fairy Shrimp (*Branchinecta lynchi)* and Conservancy Fairy Shrimp (*Branchinecta conservatio)*			–	–	–	–							Native plants and pool banks sensitive to winter grazing; indirect effects on fairy shrimp
						+	+	+	+				Competition from non-natives reduced and native grass reproduction favored by grazing in vernal pools
San Joaquin tiger beetle (*Cicindela tranquebarica* ssp.)						+	+	+	+	+			Open/barren areas in grassland habitat aided by grazing
Valley Elderberry Longhorn Beetle (*Desmocerus californicus dimorphus*)	–	–						–	–	–	–	–	Elderberry shrubs are not present on Madera Ranch. Elderberry host vulnerable to herbivory.
Western Spadefoot (*Scaphiopus hammondii)*			–	–	–	–	–						Potentially sensitive to crushing by ranch vehicles when on the surface during the wet seasons (November-March) especially at night and during rainfall
					+	+	+	+	+				Requires pools and adjacent grasslands for terrestrial invertebrate prey and access to ponds and mates when not in subterranean dormancy, April-Nov; Low herbaceous height by grazing might reduce impediments to movement

Special Resource	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Management Concerns
California Tiger Salamander (*Ambystoma californiense*)			–	–	–	–	–						Potentially sensitive to crushing by ranch vehicles when on the surface during the wet seasons (November-March) especially at night and during rainfall
					+	+	+	+	+				Low herbaceous height by grazing favors ground squirrels, which provides burrows for refuge and visibility for CTS; reduces impediments to salamander movement
Blunt-Nosed Leopard Lizard (*Gambelia [=Crotaphytus] sila)*						+	+	+	+	+			Open grassland habitat characteristics aided by grazing to maintain low herbaceous vegetation
Swainson's Hawk (*Buteo swainsoni)*						+	+	+	+	+			Low herbaceous height by grazing favors ground squirrels, which are a prey species for Swainson's hawks
Mountain Plover (*Charadrius montanus)*						+	+	+	+	+			Open grassland habitat characteristics aided by grazing to maintain low, sparse herbaceous vegetation
White-Tailed Kite (*Elanus leucurus)*						+	+	+	+	+			Low herbaceous height by grazing favors ground squirrels, which are a prey species for white-tailed kites
Ferruginous Hawk (*Buteo regalis)*						+	+	+	+	+			Open grassland habitat characteristics aided by grazing to maintain low, sparse herbaceous vegetation
Long-Billed Curlew (*Numenius americanus)*						+	+	+	+	+			Open grassland habitat characteristics aided by grazing to maintain low, sparse herbaceous vegetation
Western Burrowing Owl (*Athene cunicularia*)					–	–	–						Potential burrow damage during wet winters
						+	+	+	+	+			Low herbaceous height by grazing favors ground squirrels, which provides burrows for refuge and nesting, and visibility for owls; moderate intensity dispersed grazing leaves patchy herbaceous height, which increases prey diversity

Special Resource	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Management Concerns
Loggerhead Shrike (*Lanius ludovicianus)*						+	+	+	+	+			Low herbaceous height by grazing favors rodents, which are a prey species for loggerhead shrikes
Tricolored Blackbird (*Agelaius tricolor*)							–	–	–	–	–	–	Pond vegetation that could support nests sensitive to livestock herbivory in spring and summer
						+	+	+	+	+			Open grassland habitat characteristics aided by grazing to maintain low herbaceous vegetation
Northern Harrier (*Circus cyaneus*)							–	–	–	–	–	–	Ground nests sensitive to livestock traffic in spring and summer
						+	+	+	+	+			Low herbaceous height by grazing favors ground squirrels, which are a prey species for northern harriers
Golden Eagle *(Aquila chrysaetos)*						+	+	+	+	+			Low herbaceous height by grazing favors ground squirrels, which are a prey species for golden eagles
Merlin *(Falco columbarius)*						+	+	+	+	+			Open grassland habitat characteristics aided by grazing to maintain low, sparse herbaceous vegetation
Prairie Falcon *(Falco mexicanus)*						+	+	+	+	+			Low herbaceous height by grazing favors ground squirrels, which are a prey species for prairie falcons
Short-Eared Owl (*Asio flammeus*)							–	–	–	–			Ground nests sensitive to livestock traffic from mid-March-June
						+	+	+	+	+			Open grassland habitat characteristics aided by grazing to maintain low herbaceous vegetation
California Horned Lark (*Eremophila alpestris actia*)							–	–	–	–			Ground nests sensitive to livestock traffic from mid-March –mid-July
						+	+	+	+	+			Open grassland habitat characteristics aided by grazing to maintain low herbaceous vegetation
San Joaquin Pocket Mouse (*Perognathus inornatus)*						+	+	+	+	+			Open grassland habitat characteristics aided by grazing to maintain low, sparse herbaceous vegetation
Fresno Kangaroo Rat (*Dipodomys nitratoides exilis)*										–	–	–	The small amount of scrub habitat that could support the species potentially vulnerable to summer grazing
						+	+	+	+	+			Open grassland habitat characteristics aided by grazing to maintain low, sparse herbaceous vegetation

Special Resource	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Management Concerns
San Joaquin Kit Fox (*Vulpes macrotus mutica*)						+	+	+	+	+			Low herbaceous height by grazing favors ground squirrels, which provides burrows for refuge, and visibility; moderate intensity dispersed grazing leaves patchy herbaceous height, which increases prey diversity
Nelson's Antelope Ground Squirrel (*Ammosperm-ophilus nelsoni*)						+	+	+	+	+			Open grassland habitat characteristics aided by grazing to maintain low, sparse herbaceous vegetation
Fire Hazard					+	+	+	+					Greatest fire hazard during dry seasons; fire hazard most effectively reduced by grazing prior to the dry seasons so that grass fuels are low during the dry seasons; requires moderate to high severity grazing required
Tocalote									+	+	+		Likely disfavored (forage palatable) by grazing of elongated stems before seed set

+ = grazing could be beneficial to management of the resource.
– = grazing could be detrimental to management of the resource.

7.2 Grazing Management Units and Cattle Distribution

Current and proposed GMUs are illustrated in Figure 4. The mitigation area will use existing section line fencing. A new fenceline will be installed in the southeast quarter-section of Section 18 to separate the mitigation area from a future pond area. It is recommended to maintain the mitigation areas as single large-scale GMUs, and not develop any sub-divisions for the following reasons: additional fencing and gates would add substantial costs for construction and maintenance; while additional sub-division of grazing units would add some flexibility in livestock management, rotational grazing systems in annual grasslands would not necessarily prove beneficial (Heady 1961; Briske et al. 2008); and less sub-division appears to be associated with more heterogeneity of grassland habitat, which is preferred for biodiversity maintenance (Fuhlendorf and Engle 2001).

The non-mitigation areas typically are fenced along Section lines and could be adjusted to accommodate the mitigation areas. Management of non-mitigation areas will be feasible without any additional infrastructure.

Mineral licks will be placed by the Livestock Operator throughout the mitigation area as needed to improve the distribution of livestock. Tate et al. (2003) found that there were more livestock fecal deposits in areas where attractants were placed. Such livestock attractants can also be used to reduce livestock congregation around special-status plant species and natural communities. To maintain water quality, it is important to place the attractants away from water ways and wetlands, preferably on ridges, which have limited hydrologic connectivity to waterways. Also, attractant locations will be rotated to prevent surface compaction and damage.

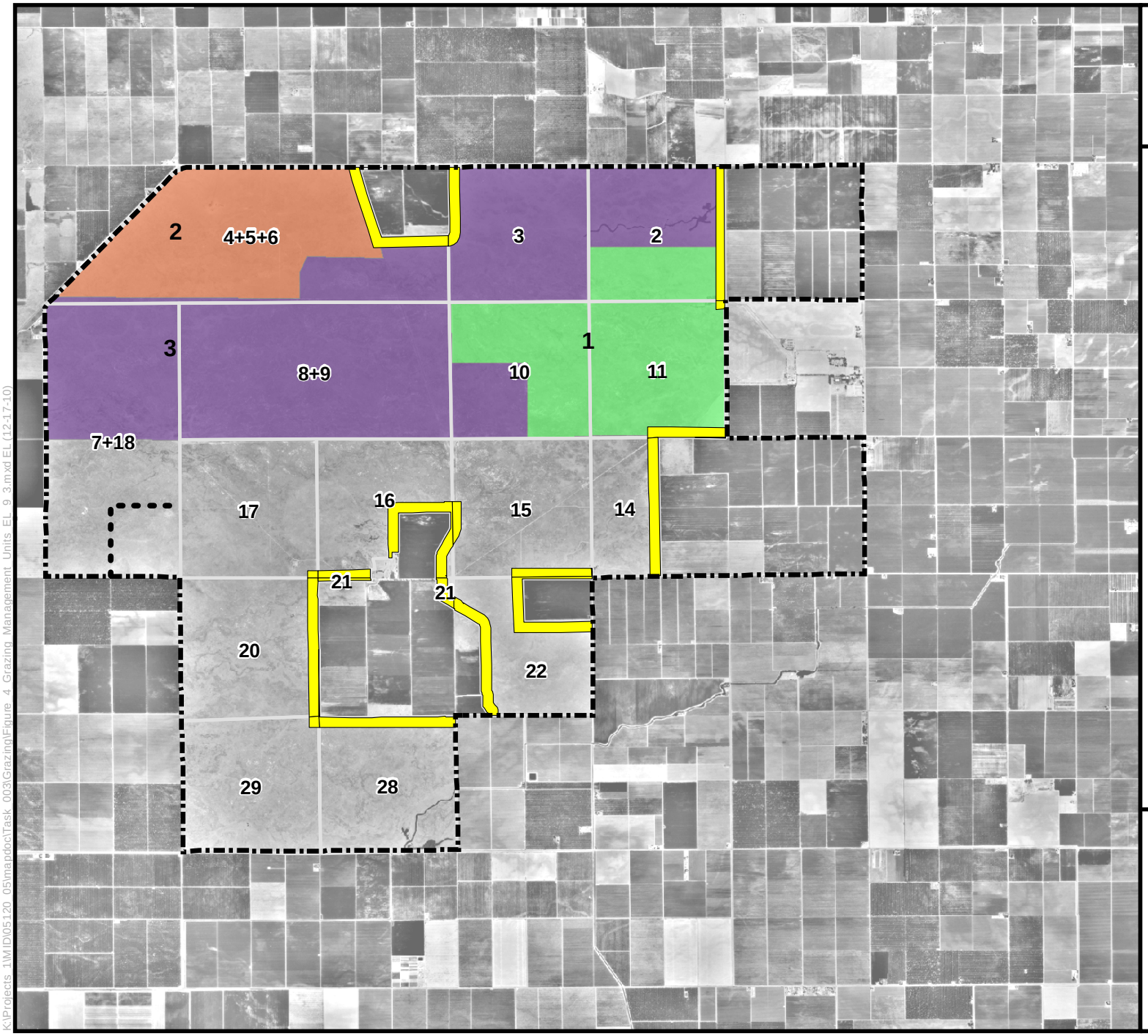

Figure 4
Grazing Management Units on Madera Ranch

Legend

- Grazing Management Unit Fenceline
- Madera Ranch Boundary
- 400 foot exclusionary fence buffer
- Proposed Grazing Management Unit Change

Mitigation Areas

- Area 1
- Area 2
- Area 3

0 0.5 1
Miles

Aerial Photo Source: USGS Digital Orthophoto Quarter Quadrangle, 1993

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If monitoring results indicate the grazing management performance standards are exceeded, grazing utilization is insufficiently distributed, or livestock traffic is excessive, then the Livestock Operator will implement additional livestock dispersal incentives to less utilized sites, such as by additional placement of mineral licks, as feasible and in consultation with MID, CRT or the conservation land manager. Stocking rates, seasonal use, and other management approaches may also be employed to ensure optimal conditions for sensitive wildlife and plants in the mitigation areas. The Livestock Operator may also use horses and riders to herd the livestock periodically as needed to achieve better livestock distribution.

7.3 Capacity Assessment

Grazing capacity is a term equivalent to "carrying capacity," and is used by rangeland ecologists and managers to estimate the maximum number of livestock and months to be grazed during a given year to avoid damage and to sustain the vegetation and related resources. Estimates of forage available for livestock at Madera Ranch were extrapolated from the Natural Resources Conservation Service (NRCS) ecological site description estimates (NRCS 1983); estimates from NRCS Madera Service Center; and the experience of the current lessee.

The stocking rate recommendations described below are conservative and should be applied with flexibility due to the variable and unpredictable nature of California's weather, which affects plant growth patterns dramatically. Thus it will be necessary to make adjustments to the stocking rates each year to meet conservation objectives and performance standards based on the experience of MID, land conservation manager, and the Livestock Operator and on weather predictions. The following stocking rates should be used by the grazing lessee, the conservation easement holder, and MID as conservative initial guidelines to determine the appropriate stocking rate each year and its adjustment.

Estimated forage production in most Sections including the mitigation area, is approximately 406,000 lbs/ac in wet years, 319,000 lbs/ac in normal years, and 232,000 lbs/ac in dry years. Normal years are those that correspond to average precipitation and temperatures; wet years are wetter and warmer, and dry years are drier and colder. However, summer decomposition, wildlife utilization, and livestock trampling loss, result in a lower estimate of forage available closer to 180,000 lbs/ac in wet years, 86,000 lbs/ac in normal years, and 0 lbs/ac in dry years. Therefore, recommended initial stocking rates in the mitigation areas are based on the amount of forage available for grazing (after deduction of the recommended residual dry matter [RDM]) call for 10-15 1,000 lb cattle for 6 months during wet years, 3-7 cattle for 6 months in normal years, and no cattle in dry years per section of land.

7.4 Grazing Prescription

The livestock grazing program for Madera Ranch will be based on cattle because that kind of livestock is relatively self-sufficient in protection against predators, requires less labor and maintenance effort, and can generate some income for MID (as opposed to incurring expensive fees for sheep and goat grazing services). However, sheep or goats may be desired in the future or may be used periodically to promote species and wetland values. Additionally, the current Livestock Operator, who has been grazing Madera Ranch for the past 23 years, already has a cow/calf operation at the site. This Livestock Operator will continue his cow/calf operation at Madera Ranch in order to achieve MID's mitigation and conservation goals.

7.4.1 Grazing Period and Adjustments

The grazing period in the mitigation area should be as short as feasible to minimize the time for negative effects of grazing. Grazing should occur mainly during the herbaceous growing seasons of winter and spring because of the need to achieve the conservation objectives of herbaceous height, density, and biomass reduction associated with fire hazard reduction and special-status natural community, plant, and wildlife habitat improvement. Grazing in the mitigation area should be avoided at other seasons because of the increased likelihood that grazing would excessively remove vegetation, damage wetlands, or cause soil erosion. Where ungrazed and during above-normal weather years, the non-native grasses and forbs that dominate the grasslands of Madera Ranch grow tall and dense. This compromises the habitat quality for the special-status natural communities, plants, and animals. Livestock grazing is the most feasible tool available to reduce the herbaceous mass and height associated with these conservation and safety goals.

In a typical year the grazing period in the mitigation area will begin November 1 and end June 1. This will be the most effective time to maintain the reduced herbaceous height and mass. Extensions of this grazing period might become beneficial in special areas when the growing season is extended by late spring precipitation, or if invasive plants, such as the tocalote, expand their current infestations, and other control efforts are not effective. Grazing in the non-mitigation area will be year-round.

Seasonal grazing during the winter through late spring (6 months) will be practiced in the mitigation area under normal circumstances. Gradual stocking up of the numbers of cattle may be practiced as needed each year. The normal grazing period will be flexible in start and end dates to accommodate cases of unusual weather, emergency loss of forage, unusually excess forage, species needs in the mitigation areas, extraordinary Livestock Operator hardship, or otherwise to meet the objectives and performance standards defined earlier. It will also be adaptable to meet special objectives in special areas, such as to control infestations of invasive plants or to enhance stands of native plants by extending or shortening the period, by concentrating grazing effects within temporary enclosures, or to experiment with other grazing regimes. This grazing period will be most effective in achieving the conservation goals, and in avoiding high-priority impacts. Minimum and maximum standards of herbaceous height, mass (Residual Dry Matter), cover, and other measures will apply to the mitigation area to achieve the objectives and performance standards. The performance standards will also be met to the extent feasible using non-fencing means to improve livestock distribution, such as mineral licks, herding, or other means as feasible.

Mean herbaceous height in the mitigation area will be maintained between 2 and 12 inches year-long to the extent feasible. In addition, the mean RDM in the autumn will be greater than 300 lbs./acre in annual grassland (see Appendix D for photograph of appropriate RDM height and mass) on 40% of the mitigation lands and greater than 600 lbs./acre on 60% of the mitigation lands .[2] A

[2] The herbaceous height range prescribed here is the height of Residual Dry Matter (RDM) expected under moderate grazing conditions and best range management practices. RDM refers to the dry mass (and height) of plant matter left on the ground from previous growth before the start of the next winter growing season. It can be measured by visual estimation (Wildland Solutions 2008) or by clipping and weighing. The amount and species of forage that is produced in a growing season is largely dependent upon the environment of soil and RDM during the previous late autumn. This environment affects seed germination and seedling growth, and will be optimized under the indicated range of herbaceous height. These RDM standards are based on the relevant dray annual grassland grazing standard for 0-10% slopes developed by the University of California Division of Agriculture and Natural Resources (Bartolome, Frost, and McDougald 2006). The standards may be adapted if the monitoring results indicate such a change.

maximum herbaceous height of 18 inches would be acceptable for short periods during the growing season, if necessary for feasibility of the livestock operation or due to excessive spring growth. Grazing only in the spring will maintain the prescribed herbaceous height and RDM level year-long, which are approximately equivalent on level sites. The mean absolute foliar cover of all herbaceous species (forage and non-forage) combined will be maintained at 70% or greater year-long.

The minimum height and RDM performance standards are required to achieve optimum forage production and good rangeland ecological condition in California Annual Grassland after moderate grazing. The upper end of the height range (12 inches [or 18 inches if necessary for short periods]) should not be exceeded because doing so would result in degradation of future forage quality and production, and in excess fire hazard.[3] The prescribed stocking rates and schedule should keep the herbaceous height closer to the lower limit of the range at the end of the grazing period in years of normal precipitation. The consequences of below-normal precipitation are discussed below.

Grimmway Farms installed 400-foot buffer fencing between the GMUs and their agricultural crops. Cattle will be excluded from the buffers between planting (March to mid-June) and harvesting (late-July to late-November) of carrots only. During all other times, livestock will be allowed inside the buffers. This will not affect the stocking rate inside or outside the mitigation area because livestock will be allowed to graze the buffer for at least 3 months each year. There is no pre-defined grazing period for non-mitigation lands.

7.4.2 Stocking Rates and Adjustments

The normal stocking rate for each GMU in the mitigation area during the 6-month grazing period will be based on the estimated number of pounds of forage available in a normal year (10-15 1,000 lb cows for 6 months per section). Cows and calves will be grazed, so an appropriate stocking rate must be calculated for their sizes and ages.[4] Each type of animal will be included separately in a stocking rate formula based on their equivalent forage requirements by age categories, and substituted accordingly. During the spring months, green grass will be likely to grow faster than the livestock consume it, and heights will be at (or temporarily exceed) the high end of the optimal range. It will be conservation land manager's and Livestock Operator's responsibility to discuss and determine the practicality of increases or decreases in the number of livestock to achieve the objectives and performance standards in each mitigation area GMU each year.

When the weather predictions indicate a normal year and normal forage production, the normal stocking rates will be used in the mitigation area. Such predictions can be made with reasonable precision in the late winter. There could be significant variation in grazing utilization during some years since the micro-topography (low areas and upland areas) allows excess water to accumulate

[3] The effect of such herbaceous heights on forage production at sites with moderate precipitation is variable, but can decrease forage production the following year (Bartolome, Stroud, and Heady 1980). That result would not be detrimental in this situation. Such flexibility is needed for feasibility of the planned grazing operation.

[4] Animal Unit Equivalents (AUEs) are the weights of an animal as percentages of the weight of a mature cow (1000 lbs.). In this case, the AUEs for stockers should be based on their weights at selected ages or times, e.g. a 200 lbs. calf would be a 20% AUE. The AUEs for a yearling stocker steer at 750 lbs. would be 75% (Holechek, Pieper, and Herbel 1989:195). For example, using 10 AUs as the base, the AUE stocking rate for 750 lbs. stocker steers would be 13 steers [10 AU / (0.75 AU/steer) = 13.33 steers], which means that 13 steers are equivalent to 10 cows. The AUE for a cow/calf pair would be based on their combined weights. For example, an 800 lbs cow and 200 lbs. calf would be 100% AUE or 1 AU.

in the low areas and livestock will concentrate in the upland areas[5]. The monthly stocking rates for the current year will be reduced to appropriate levels from the planned normal year rates when a substantial deficit of forage is predicted. When a substantial forage deficit occurs, but was not predicted, the operator will be give 72 hour notice to begin removing stock and the stocking rates will be reduced as per the notification within 14 calendar days. For years following an unexpected drought year, the base stocking rates for the next year will be reduced (anticipating a repeat of drier conditions) whether or not the predictions indicate below-normal forage production the next year. The reduced stocking rate will be based on the expected number of pounds of forage to be available in the next drier month or year. In extremely severe drought years, the available forage might be less.

When a wetter year is predicted or occurs, and forage production exceeds the normal amounts as confirmed by monitoring, the Livestock Operator may, at the discretion of conservation land manager, temporarily increase the stocking rates in the mitigation area to make use of the excess forage during the forage growing season. That will be considered an exceptional circumstance and response, which will benefit conservation at Madera Ranch. Monitoring will determine whether the increased rates should continue.

Rest from grazing is not a critical requirement in well-managed healthy California annual grasslands. Rest need not be planned unless merited by monitoring results that indicate poor ecosystem health conditions. If rest is practiced due to severe drought, it should continue as long as the predicted forage production for the year will be poor enough to maintain average herbaceous height below the upper limit of the optimal range without grazing. In such an unusual case, the excess herbaceous height due to rest would probably not reduce habitat quality for the potential special-status natural communities, plants, and animals.[6] However, in a normal production year, rest could reduce habitat quality. There is no stocking rate prescription for non-mitigation lands though they should follow similar guidelines for a healthy ecosystem.

7.4.3 Livestock Distribution

If monitoring results indicate the grazing management performance standards are exceeded in the mitigation area, grazing utilization is insufficiently distributed, or livestock traffic is excessive, then the conservation land manager and Livestock Operator will implement additional livestock dispersal incentives to less utilized sites, such as by placement of mineral licks, as feasible. The Livestock Operator may also use horses and riders to herd the livestock periodically as needed to achieve better livestock distribution.

7.5 Existing and Recommended Livestock Management Infrastructure

Functional livestock infrastructure is essential to the implementation of this plan. Madera Ranch is equipped with all necessary livestock infrastructure. Perimeter fencing at Madera Ranch is in good condition. Twenty to thirty miles of functional cross fencing runs along Section lines to support grazing operations. The Livestock Operator is responsible for maintenance of the cross fencing.

[5] Jaymee Marty observed overutilization of the upland areas in September 2007, a drought year (Marty, pers. comm. 1 April 2009).

[6] This plan did not assess the degree and tolerance limits of reduced habitat quality for the special-status natural communities, plants, or animals.

Gates throughout Madera Ranch are operational. Additionally, Grimmway installed 26 miles of new fence to create the 400-foot buffers from their agricultural crops. A domestic well at the center of the ranch supplies water to at least one functional water trough in each Section. Modified fencelines will be installed as described above.

7.5.1 Fencing

All existing and new perimeter, internal cross, and exclosure fences that are designated to be part of the grazing management program must be maintained in good working condition to contain the grazing livestock, prevent passage by trespassing livestock, limit unauthorized vehicle access, and allow authorized access for adopted management activities. Fencing may be limited to conventional four-strand barbed wire with metal or wooden posts designed to achieve the combined conservation, recreation, and cattle management goals. Perimeter fencing and any associated access points must be built and maintained to meet the legal requirements of California Livestock Law, thus reducing risks of liability claims against MID or the Livestock Operator for negligence in the event of livestock escape and resulting accidents or other damages.[7] It is recommended to use designs equivalent to or better than the standard 4- or 3-strand fence specifications provided by the NRCS (Appendix E), with the exception that the top strand of barbed wire on perimeter fences will be 48 inches above the ground to meet the legal requirements. If "wildlife-friendly" fencing is desired in the future (i.e., barbless upper and lower strands), qualified fencing contractor with experience in building fences for conservation and cattle management purposes (possibly including the Livestock Operator) should be consulted and contracted for the fence installations and repairs.

7.5.2 Gates

Madera Ranch currently has a sufficient number of functional gates for livestock operations. Gates can be opened or closed to improve distribution or encourage more utilization in certain areas. If, in the future, additional gates are installed, they should be sufficiently durable to resist damage by livestock and wide enough (approximately 16 feet) to allow trucks to pass and for the Livestock Contractor to use the gate when delivering or removing the livestock. Gates will be maintained in good working condition to contain the grazing livestock, limit unauthorized vehicle access, and allow authorized access for management activities.

7.5.3 Watering Facilities

Madera Ranch has sufficient existing watering facilities for livestock operations. These facilities should be maintained to provide healthful water of sufficient supply. If additional or new water facilities are needed in the mitigation areas, the Livestock Operation will contact MID, CRT and the conservation land manager to discuss. These facilities may require additional consultation with the resource agencies if disturbance over 1 acre is needed.

[7] California Food and Agriculture Code 17121 requires that the top wire of the fence be at least 48 inches off the surface of the ground, with secure fastening to posts, which must be firmly set in the ground and spaced not more than 16.5 feet apart; any other kind of fence of height, strength, and capacity equal to or greater than the wire fence is lawful; cattle guards must be constructed with width, depth, rail spacing, and other construction design to "effectively turn livestock."

Watering System Options

At least one functioning watering trough is currently maintained within each Section (Urrutia personal communication). No additional water troughs are needed at this time. However, more than one trough would aid in the distribution of livestock in each Section due to the large acreage. Additional watering troughs would improve livestock distribution and attract cattle away from sensitive habitats. Installation of any future watering systems in the mitigation areas, though not currently proposed, must be supervised by a biologist and should be located more than 250 feet from a vernal pool or alkali rain pool. Any future watering systems should be designed to allow the system to be shut off both at the source and at the trough during the non-grazing periods of the year and for maintenance.[8] The trough water supply should have float valves to maintain the trough water level.[9] The most efficient option to develop future facilities would be to tie into the domestic well at the center of the ranch. This would involve the construction of pipelines from the well directly to each trough, and require sufficient water pressure at the source to deliver water to the trough locations. If the well has insufficient pressure to deliver water consistently to the troughs, then a cistern must be added to the affected water system. If the well is not available or become unavailable, then the second most efficient option would be to plan for water tanker deliveries to accessible cisterns (optimal size approximately equivalent to at least two-times the tanker truck capacity so that it can be re-filled when half-full, with capacity to spare) during the grazing period. This option would require truck access, cisterns on stable pads, plumbing from cisterns to troughs, and troughs. Whether any of those parts should be temporary or permanent should be investigated and determined as a tactical decision by MID. The third option is most expensive in the short term—drilling a well and installing permanent delivery systems. A fully-functional conventional well system would include drilling, encasing the well, well housing, a water pump, an electric source (to power the pump) and connecting lines, plumbing from the well to cisterns and troughs, cisterns, and valves.

Maintenance of the watering system is typically within the capabilities of the Livestock Operator and occurs infrequently (i.e., less than once every 10 years). Vehicle access will make use of existing ranch roads during maintenance, repair or replacement of these facilities.

Livestock Water Demand

Livestock require sufficient water for maintenance and growth. This demand may be calculated using a formula based on the physiological requirement of 10-20 gallons of water per day by one typical 1,000-pound cow (UCCE 2001). Watering demand varies primarily with air temperature; summer air temperatures of 90 degrees F would increase the watering demand of the 1,000-pound cow to 20 gallons per day. This formula should be adjusted for different kinds, classes, and weights of livestock, and multiplied by the number of animals. The water source, storage, and delivery system to the trough must accommodate both daily demand (typically two drinking periods per day) of the livestock herd in the affected grazing unit and loss of water due to leakage, fouling, evaporation, and wildlife use. Leakage and fouling can be avoided with proper maintenance (which should be included as a requirement of the lessee in the grazing lease). The current Livestock Operator regularly cleans the troughs and maintains float valves set to keep the water level 2 inches from the lip in order to allow calves to drink (Urrutia personal communication). The other loss

[8] An argument and conditions required to supply water for wildlife during the non-grazing period is made in the section below on wildlife friendly troughs.

[9] Hudson float valves are preferred for durability and ease of maintenance.

factors can be estimated and accommodated by increasing capacity based on knowledge of wildlife demand and assumption of 25% evaporative loss compounded over the grazing period.

Wildlife-Friendly Troughs

If and when water troughs are replaced within the mitigation area at Madera Ranch, it would be beneficial to enhance wildlife use (and avoidance of drowning or entanglement) by providing safe and effective access to water for drinking and bathing by birds, bats, and other animals. Existing water troughs, inside the mitigation area, could be easily improved by installing wildlife ramps as described below. Design criteria for wildlife-friendly troughs include (Taylor and Tuttle 2007; NRCS 2007; Appendix F):

- Maintain trough water levels at less than a few inches below the top rim (to facilitate drinking without falling from the rim into the trough);
- Provide for escape and access of small animals by using rough grippable surfaces and secured ramps (concrete,[10] composite plastic, or expanded metal) slope no greater than 45 degrees) from the bottom of the trough, up the perimeter (attached flush to the side, at one end if a rectangle) of the trough, to the top rim of the trough (Appendix F, Photos #1-2); temporary or unsecured devices made of rocks, branches, or boards often fail; install more than one ramp if feasible to increase the chances of wildlife escape (Figure 1 in Sherrets 1989:23 shown in Appendix F);
- Eliminate obstructions in flight paths (for birds and bats) and entanglements (for larger animals), such as plumbing housings or overhanging posts, wires, braces, and vegetation;
- Provide trough height and length suitable as low and long as feasible, but minimize potential for fouling of the water; trough height should be about 20 inches for access by low stature mammals, such as deer (Sherrets 1989); trough length, minus any plumbing housing should provide at least 4 feet (10 feet is preferred) of open surface for in-flight drinking (by bats); ground-level or very low troughs pose the risk of livestock injury as well as fouling due to collection of animal wastes and contamination from surface run-off;
- Maintain the water supply in the mitigation area to the trough sufficient for both livestock and wildlife use during the grazing period; this adds to the demand and the water delivery capacity required during the grazing period; thus, demand and capacity could be less during the non-grazing period or when wildlife demand is less; however, if regular maintenance is curtailed during the non-grazing period, and trough water levels and water quality won't be maintained, then the troughs must be drained to avoid attracting and harming wildlife.[11]

Erosion-Prevention

If additional troughs are installed, protect the soil around the trough where livestock trample and congregate and water overflows by installing water-permeable surface hardening of gravel surrounding the trough within a 15-foot radius in a slightly elevated platform under and around each permanent trough to reduce soil compaction and erosion due to excess livestock traffic (Appendix F).[12] The current Livestock Operator has built the existing water troughs in this manner

[10] Concrete is the preferred trough material at sites with the potential for puncture by bullets.

[11] A 3-inch diameter drain should be built into one wall of the trough for cleaning.

[12] The photo of the watering trough in Appendix E does not clearly show the hardened surfacing on all sides of the trough; in this example, gravel should be in place on the sides not covered by concrete.

(Urrutia personal communication). Locate the trough and associated facilities on a level site with a foundation that won't settle. The precise siting of troughs is important to assure minimal erosion as the cattle congregate around it, and a feasible topographic position for delivery of the water from the source to the trough. Each of the related components should be located on a relatively level place without nearby slopes that prevent maintenance vehicle access. If gravity will be used to deliver the water from a cistern, then the trough must be situated at a lower elevation than the outlet of the storage cistern. The distribution pipelines should be buried to reduce heating and maintain reduced water temperatures. Before digging the conservation land manger should be notified. Other considerations for the precise location of watering facilities include avoidance of sensitive habitat areas and restoration planting sites.

Vehicle Access for Installation

If, in the future, additional watering facilities are installed, this would involve either transporting a pre-constructed trough unit (or a portable trough), concrete, gravel, and other materials to the selected installation sites, or constructing the trough in place. The relative merits of these options depend on costs, including whether the grazing lessee has portable troughs and other materials available to bring to the site or is willing to construct permanent facilities as part of the lease arrangements. This will require adequate vehicle access to develop the watering facilities, including installation of the trough's foundation, hardening material around the trough, and associated piping and water source. Access will use existing ranch roads and new roads would not be created in the mitigation areas. Access would also be needed for water tanker trucks to refill any storage tanks and for future maintenance. Therefore, adequate vehicle access and species and habitat concerns must be considered in selecting the installation sites.

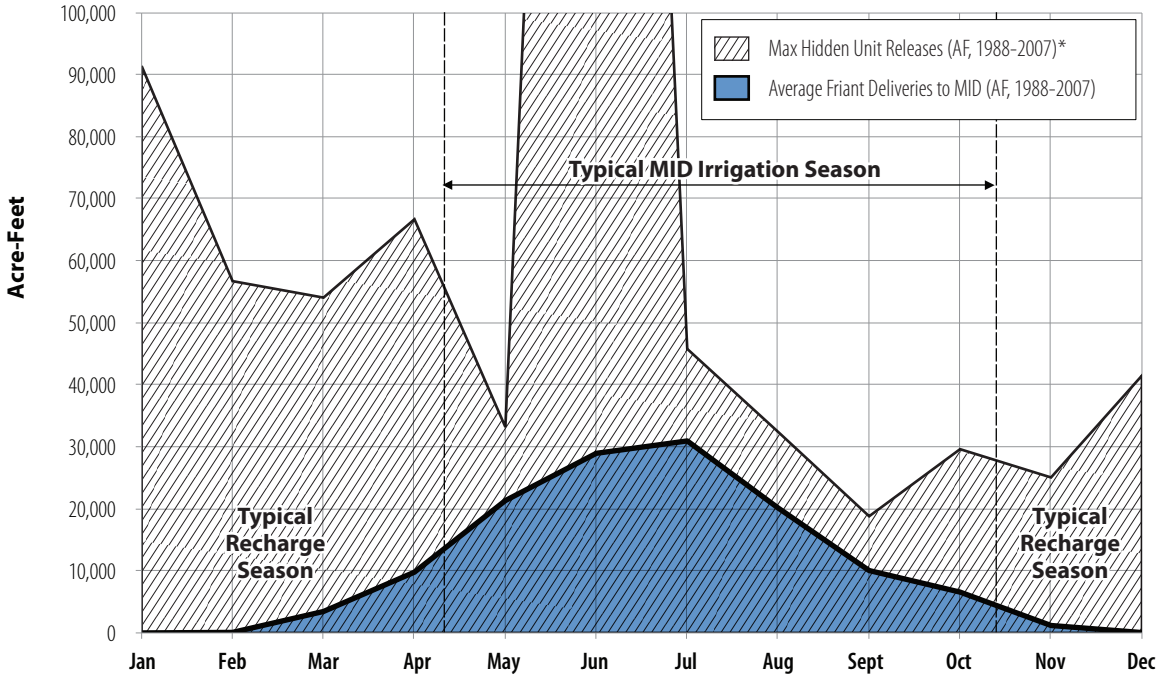
It is beyond the scope of this plan to design the elements of the needed watering facilities beyond identifying needs, potential options, conservation issues, and preferred locations. MID should contact their local office of the NRCS (Madera Service Center, 425 N Gateway Drive Ste. E, Madera Ca 93637-3163, 559-674-4628) for more guidance on recommended designs for all elements of the livestock watering systems if necessary. The NRCS watering facility practice standards are shown in Appendix G.

7.5.4 Access and Livestock Staging

The Livestock Operator currently has access to Madera Ranch and at least one suitable cattle staging area. This includes permitted access for livestock maintenance personnel by vehicle, ATV, or horse. This access is suitable to accommodate at least one medium-sized or larger livestock transport truck to an appropriate place inside Madera Ranch's grazing areas with appropriate space for a corral and a truck turn-around. The staging area has a water source available for livestock.

8 Water Management

MID will bank a portion of its long-term water supply made available by contracts with Reclamation (Friant Division and Hidden Unit supplies), CVP uncontrolled flows provided under temporary contract and MID's pre-1914 non-CVP water rights supply. It is expected that average annual water available for banking would be approximately 20,000 af (15,000 af with river restoration) with wet years providing up to 55,000 af. Water typically would be banked from mid-October through mid-April, depending on water-year type and availability. Figure 5 illustrates the typical recharge season



* Hidden Unit releases are illustrated because they best represent the timing and magnitude of when water would be available for banking.

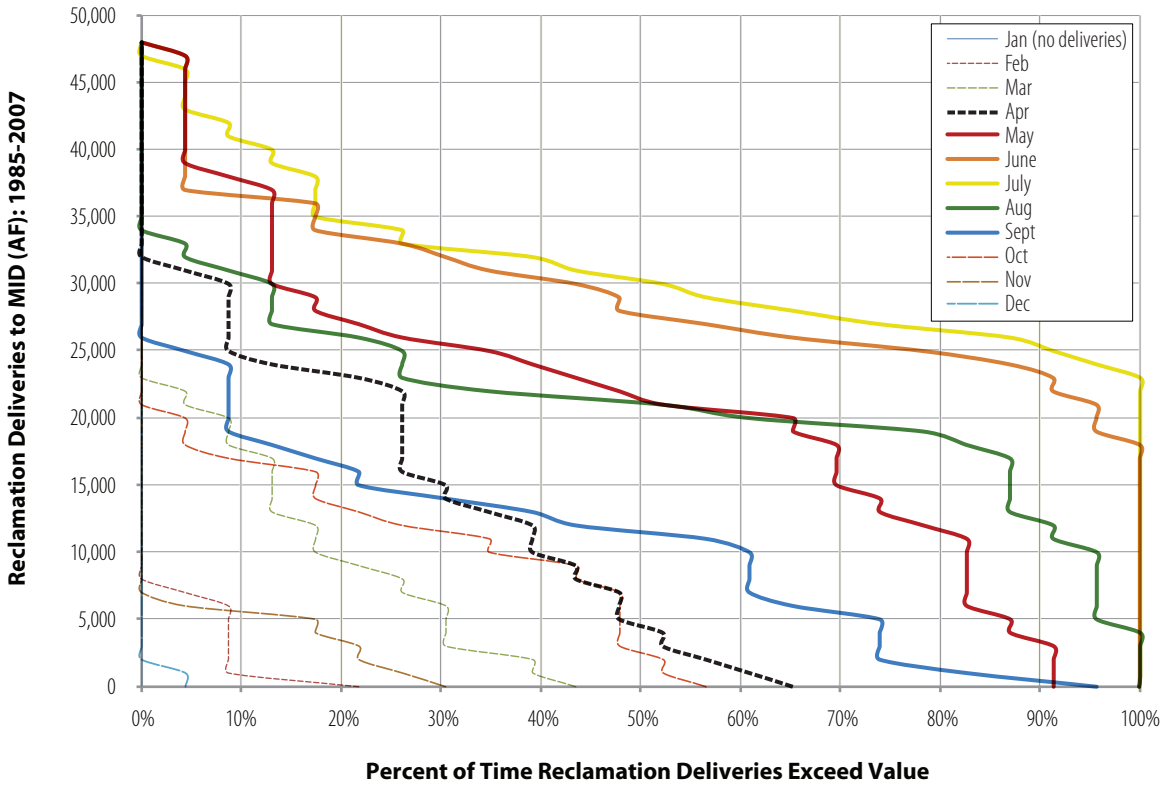


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Figure 5
Typical Recharge Season and Historic Deliveries

and historic deliveries. The upper part of the figure shows maximum Hidden Unit releases in relation to average Friant Division deliveries to MID, and indicates that off-season deliveries could occur and be used for recharge when water is available. Large amounts of water are unlikely to be banked during the summer because MID's system is being used to convey water to farmers. The lower part of the figure shows that based on historic deliveries, more than 45,000 af was available less than 5% of the time; in May, for example, approximately 45,000 af was available 5% of the time, 25,000 af was available 70% of the time, and 18,000 af was available 100% of the time. Water supply estimates based on the record from 1985 through 2007 indicate great variability in banking opportunities, ranging from less than 20,000 af in 61% of years to more than 20,000 af in 39% of years.

Water would be delivered into distribution ditches, swales, and recharge basins through the enlarged Section 8 Canal, the 24.2-19.5 lateral, the Gravelly Ford Canal, and Cottonwood Creek. Parshall flumes and weirs would be installed in these conveyances to regulate and measure flows in the same fashion as has already performed throughout the MID and Friant systems for decades.

Upstream recharge basins would be used for sedimentation. Flows through ditches, swales, and basins would be regulated in accordance with monitoring and operating criteria designed to prevent overflows and unacceptably high water table elevations beneath adjoining properties. MID would control upstream, off-site flows to avoid spillage in the same manner that current water operations are conducted. Ditch riders would monitor the flow in each canal, ditch, swale, and recharge basin to ensure proper control of flows and to ensure that programmed water levels in the recharge areas are maintained. Spillage would be minimized through diligent observation of conditions in accordance with MID's standard operating schedule.

8.1 Swales

Flows in the swales would be constrained by acreage (approximately 550 acres) and the canal's capacity to deliver water to the swales. Water depths could range from several inches to several feet depending on the topography of the swales, percolation rates, and the amount of water being applied. Flows in the canals would be constrained by capacity, and recharge for banking in the canals, including Gravelly Ford Canal, would depend on the percolation rates. During water years with limited water available for banking, MID would use canals and selected swales to bank available supplies. The swales would be selected based on readily available canal delivery locations and other management needs. Flows to the recharge ponds, should they be needed, would be similarly constrained by seasonal water availability and delivery capacity. Peak recharge flows would be monitored during the first several high flow recharge events to determine the total inundation area does not exceed the area calculated during rating curve development. Additionally, MID will seasonally restrict the banking of water in a portion of Mitigation Area 3, west of Gravelly Ford Canal in Sections 4, 7, 8 and 9, to between October 15 and May 15 to more closely match the existing hydrograph.

8.2 Canals

Approximately 5 miles of new canals will be constructed in uplands and 3 miles of reconditioned canals will be improved on Madera Ranch. The canals will serve a dual function of conveying water, but also of percolating water into the aquifer. For example, Gravelly Ford Canal effectively works as a large recharge pond.

Upstream recharge basins would be used for sedimentation. Flows through ditches, and basins would be regulated in accordance with monitoring and operating criteria designed to prevent overflows and unacceptably high water table elevations beneath adjoining properties.

MID would control upstream, off-site flows to avoid spillage in the same manner that current water operations are conducted.

Spillage would be minimized through diligent observation of conditions in accordance with MID's standard operating schedule.

8.2.1 Application Rate

In general, when doing initial operations, MID would step up the flow into a swale in discrete increments (typically around 2–5 cfs per increment), and once the inundation for that flow has stabilized (typically within 1 day), MID would GPS the wetted extent. MID then would step up to the next higher flow increment and repeat the process. MID followed this process in a pilot project until they reached the maximum wetted extent. These flow-versus–inundated acreage data pairs allowed MID to build a "rating curve" for a swale. This curve allowed MID to predict very accurately the wetted area given a certain flow. MID then would repeat the construction of the rating curves approximately 2–3 more times during a recharge season so that MID can observe how the swales perform over time. Because MID is stepping up from low to high flows, MID would be able to observe how each incremental segment of a swale contributes to or detracts from performance. MID will install "benchmark" stakes around the perimeter of the maximum wetted swale area; a map of the benchmark locations will be provided to the permitting agencies to ensure water goes where anticipated and that avoided waters of the United States are truly avoided.

The maximum application rate to each swale by facility is provided in Table 7.

Table 7. Canal Conveyance Capacity and Swale

Project Elements	Capacity (cfs)	Swale Section
24.2 Canal Improvements	100	NA
Section 8 Canal, Cottonwood Creek, and Main No. 1 Canal connection Upgrade	100	NA
Section 8 Canal Upgrade (Enlargement)	200	NA
Section 8 Canal Upgrade (Piped)	200	Recharge basin in 13
Section 8 Canal Western Extension	50	10, 14, 15, 22
Section 8 Canal Northern Extension	50	3, 4
Section 8 Canal Section 14 Lateral Extension	20	14, 15, 22
Section 8 Canal Section 1 Lateral Extension	20	Recharge basin in 1 and grassland in 2, 11
GFC Section 21 Northern Lateral	20–50	20
GFC Section 21 Western Lateral	20–50	20
GFC Section 22 Southern Lateral	20–50	28

NA = Not Applicable; GFC = Gravelly Ford Canal
Application rates can be adjusted by the turnouts at.

8.2.2 Area of Inundation

This section describes how water banking areas are expected to be prioritized. MID would fill canals and apply water to swales in the priority illustrated in Figure 6. The intent of this prioritization is to minimize the long-term adverse effects on vernal pools by use of the swales for banking water and to ensure that Mitigation Areas 1 and 2 are not adversely affected by water banking.

MID will obtain a detailed topographic survey and monitor the level of inundation in areas used for water banking on its Madera Ranch project. Within the ranch certain fields and swales will typically be flooded during the mid-October through mid-April time frame, with temporal duration ranging from only a few weeks to several months depending on how wet the year is.

To date MID has monitored the extent of flooding by personnel walking the site with GPS systems. The goal a future measurement effort is to provide a highly accurate assessment of the flooded extent as a check of these measurements. Satellite imagery will be used to confirm the GPS rating curve data and total wetted area. Because of the nature of the satellite imagery collection schedule, there could be potential dates when the only available date to collect the aerials would be slightly different from the dates the GPS data was collected because of cloud cover. MID would skip collection dates with more than 15% cloud cover in order to ensure that the satellite-derived estimations are as accurate as possible.

Satellite imagery will be obtained from QuickBird™ Imagery from DigitalGlobe, or similar provider with similar qualifications. QuickBird orbits the Earth in a near-polar or "sun-synchronous" orbit, meaning that it passes nearly overhead at approximately the same local time on each pass, which, other things equal renders images with similar solar illumination characteristics over time. By limiting the look angle to 20 degrees off nadir or less (nearly vertical), the number of imaging opportunities at this latitude is between 5 to 15 days per month.

The QuickBird satellite can image the Earth simultaneously using panchromatic (one wide spectral band with spatial resolutions as sharp as 0.6 meter) and multispectral (four narrower spectral bands covering the blue, green, red, and NIR portions of the spectrum with spatial resolution as sharp as 2.4 meters) sensors. The sensor package's swath imaging width is over 10 miles wide, which would cover the entire ranch in a single pass of the satellite on most near-vertical nearby orbits.

When mapping a land/water interface, at least one band in the infrared portion of the spectrum (wavelength longer than 0.7 micrometers) is necessary. QuickBird's Band 4 (0.76-0.90 μm) covers the near-infrared portion of the spectrum, and establishes the Quick Bird's satisfaction of the minimum requirement for mapping the land-water interface.

Base Map Generation—An initial near-vertical (15-20 degrees off-nadir) QuickBird image will be acquired using both the panchromatic and multispectral sensor packages. A baseline image was acquired in June 2010. This image was orthorectified to portray each pixel exactly as if the viewer were looking at it from directly above. Orthorectification is essential to assure that successive image pixels match up to the initial image and to the study area map to ensure accurate assessment of the extent of inundation.

Inundation Analysis—MID will compare the wetted classifications from the aerials to the GPS data collected during the rating curve process to verify that the inundation area has been accurately measured. Several images will be acquired during initial swale inundation to verify GPS data

collected during rating curve development and two additional images will be secured during peak recharge events to confirm wetted areas and assess overall site changes.

8.2.3 Duration of Inundation

As indicated above, water typically would be banked from mid-October through mid-April, depending on water-year type and availability. The duration of inundation during this time will also vary based on availability of water for banking. Swales could be wetted for several days to several months, though typical recharge operations are expected to occur over several weeks. MID will seasonally restrict the banking of water in a portion of Mitigation Area 3, west of Gravelly Ford Canal in Sections 7, 8 and 9, to between October 15 and May 15 to more closely match the existing hydrograph. No limit is currently proposed on the duration of inundation in other areas as the swales are to be used as needed to support water banking operations. However, MID has determined that there is not sufficient supplies to keep them wet year round. DFG is concerned that multiple wetting periods in a single season could allow burrowing mammals to create new burrows which could then become occupied by blunt-nosed leopard lizards which would drown during summer operations – should this occur. Therefore, additional avoidance measures for this species will be implemented as described in the environmental commitments in Appendix A.

8.2.4 Monitoring and Operational Constraints Plan

The MROC would implement the Monitoring and Operational Constraints Plan (MOCP) (Madera Irrigation District 2007) to ensure there are no unacceptable impacts on groundwater levels or quality. The MOCP (Appendix H) includes the following components.

Water Level Monitoring—MID would monitor water levels in on-site and off-site wells and adjust recharge operations to prevent off-site water levels from rising to within 30 feet of the ground surface. In the event that off-site water levels rise to within 30 feet of the ground surface, recharge operations would be halted and not be restarted until approved by the MROC. During recovery operations, MID would monitor water levels with operational adjustment, compensation, or provision of alternate sources of water in the event that water levels drop to unacceptable levels in off-site wells as a consequence of operations.

Water levels would be monitored in a network of wells that would include:

- recovery wells,
- wells near the Madera Ranch boundary, and
- select irrigation wells located at varying distances from project facilities.

The MROC determined the numbers and locations of wells to be monitored. These wells and their monitoring frequency are illustrated in Figure 7. All wells installed only for monitoring purposes would be constructed within existing roads or lands already disturbed by other components of the project (e.g., recharge basins).

The MROC would establish protocols to adjust operations and to avoid, minimize, or recommend compensation for adverse effects. Monitoring data collected during recharge and recovery would be interpreted using methods preapproved by the MROC to provide two levels of protection. First, data would be used in real time to adjust operations. Second, if, after adjusting operations, data indicate that off-site water levels would decline or rise (or have declined or risen) an unacceptable amount as a consequence of operations, the MROC would be immediately notified.

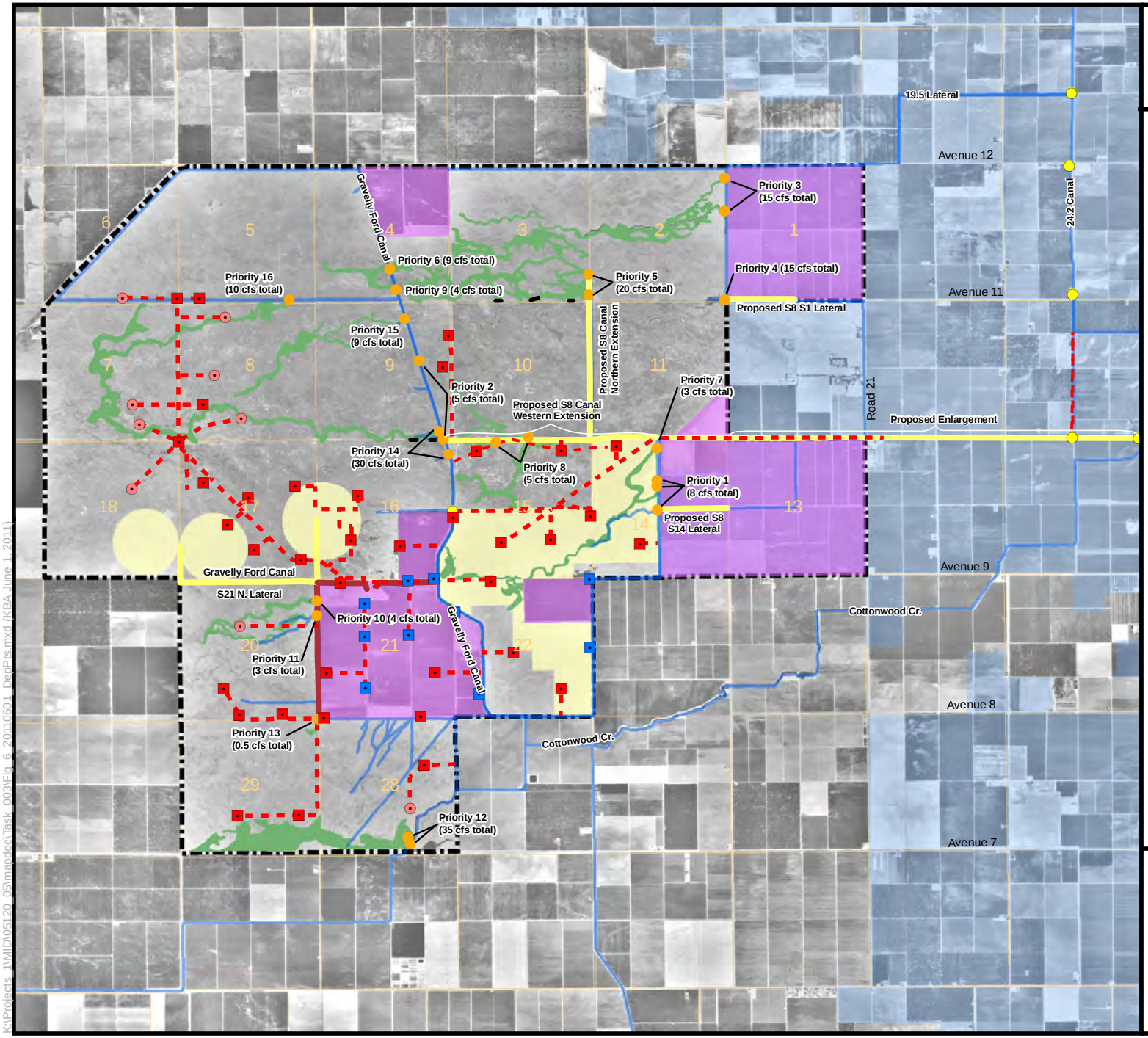

Figure 6
Flow Deposition Points

Legend

- Section Line
- Madera Ranch Boundary
- Madera Irrigation District
- Swale Recharge Areas
- Existing Wells

Phase 1 Improvements

- Recharge Basins
- On-Ranch, In-Lieu Recharge Facilities (existing row crops and vineyards)
- Conveyances
- Gravelly Ford Canal and Lateral Improvements
- Canal Improvements
- Proposed Berm

Phase 2 Improvements

- New Wells - Optimistic Approach*
- New Wells - Conservative Approach*
- Preliminary Lift Station Location
- Deposition Points
- Potential Recharge Areas
- Buried Recovery Piping

* The actual number and locations of new wells may vary from those depicted here, following detailed engineering design and adjustment during staged installation. For the purposes of this document, it was assumed that all wells depicted in this figure may be constructed and/or used.

0 0.5 1
Miles

Aerial Photo Source: USGS Digital Orthophoto Quarter Quadrangle, 1993

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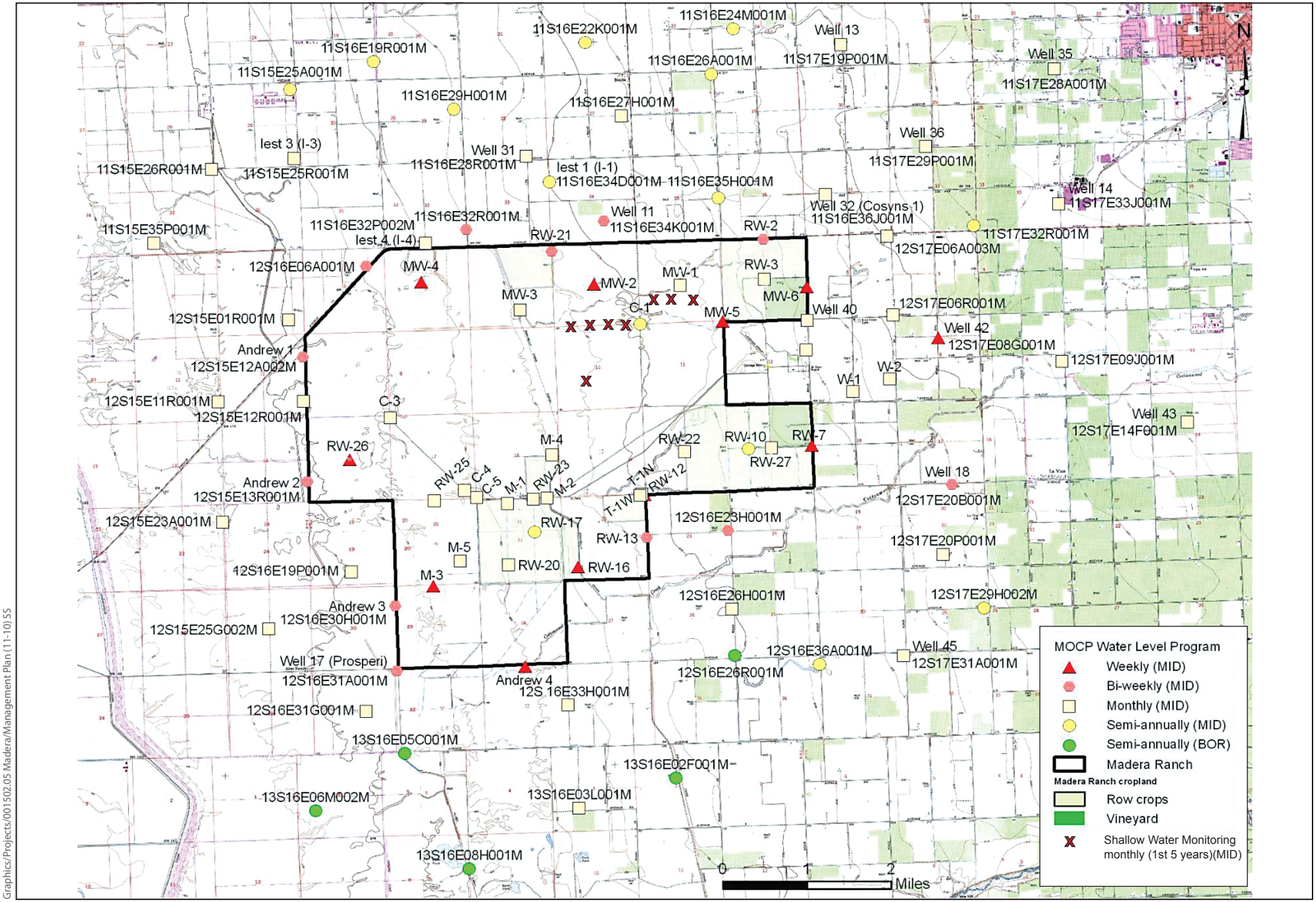

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Figure 7
Proposed Water Sampling Locations and Timing

Beyond the MROC monitoring program, eight additional shallow water monitoring devices will be installed adjacent to swales used for banking to determine if there may be near surface lateral migration of water. These devices will be between 3-20 feet deep and could include, pizeometers, or other devices, except neutron probes. They will be monitored monthly during the first 5 years of operations to determine if areas outside the swales are being wetted and quarterly for the remaining duration of operations at the WSEP. (Figure 7).

Water Quality Monitoring—The project primarily would convey and recharge water originating from Millerton Lake (Friant Division water) with lesser potential contributions of Fresno River water originating from Hensley Lake. These waters have been conveyed through the MID system and used for irrigation throughout the district for over 50 years. Friant water is recognized as high quality and generally of higher quality than the underlying groundwater.

MID's daily, ongoing operations currently include surveillance of conveyance facilities to ensure that accidental spills of hazardous materials that may occur near its facilities are discovered and addressed to prevent contamination of MID's water. This surveillance would continue and extend to the facilities constructed as part of the project.

In addition to these precautions, MID believes it is important to monitor water quality. Water banked at Madera Ranch must not impair any designated beneficial uses of water or violate the water quality standards and objectives as defined in the Water Quality Control Plan for the Sacramento and San Joaquin River Basins (Basin Plan) (Central Valley Regional Water Quality Control Board 2007). Therefore, in addition to its ongoing surveillance program, the MOCP water quality monitoring includes:

- sampling and analysis of recovered water leaving Madera Ranch and groundwater flowing away from Madera Ranch for total dissolved solids (TDS) to ensure that levels remain appropriate for irrigation purposes; and
- sampling and analysis of samples from drinking water wells within 1 mile of the project for fecal coliform, TDS, and select components of TDS as specified by the MROC.

Water Accounting—MID already extensively monitors flow throughout its system and those data would be used by the project. Flows would be monitored where water enters Madera Ranch and where water leaves Madera Ranch. In addition, MID would monitor flows to specific recharge areas and from individual recovery wells for operational purposes. Recharge areas include swales, recharge basins, and in-lieu recharge areas (i.e., those areas where surface water will be used in-lieu of pumping groundwater).

Precipitation, wind, evaporation, and temperature would be monitored to calculate net precipitation and evaporation effects. Taken together, the data and estimates from all of these systems would be used to estimate evapotranspiration losses (from vegetation, crops, and recharge areas), recharge during conveyance, recharge into the facility, and recovery.

Recoverable Recharge—Recharge that occurs during conveyance through the off-ranch MID system is part of normal MID operations and thus would not be considered banked because it is an existing condition that would not be changed by the project. Flow into Madera Ranch and recharge areas would be monitored. Flow into recharge areas, minus estimated evaporation and evapotranspiration, would be considered banked. However, only 90% of the banked water would be considered recoverable, because 10% of the water applied would be retained in the bank to reduce overdraft rates.

Recovery—Flow from recovery wells, minus recharge during conveyance to the perimeter of Madera Ranch, would be considered recovered water. Recharge of recovered water during conveyance would be considered returned to the water bank.

Almost all aquifer banking projects experience migration of recharged water away from recovery systems over time. In addition, a portion of early-season recharge water typically becomes inaccessible to recovery systems either through perching above silts/clays or through banking in sediments that drain too slowly to be of practical use to recovery systems. MID has concluded that actual aquifer losses cannot be reasonably predicted in a way that would adequately protect surrounding landowners from "overextraction." Therefore MID has committed to operational constraints to leave 10% of the recharged water behind to ensure that the Proposed Action results in a net reduction in the rate of overdraft and to prevent "over-recovery."

Subsidence Monitoring—Historically, subsidence has occurred to the west of Madera Ranch. However, ground elevation monitoring conducted by the U.S. Geological Survey (USGS) has indicated that no more than 1 foot of subsidence has occurred on Madera Ranch even though the area of Madera Ranch has been subjected to more than 100 years of intense groundwater pumping from above and below the Corcoran Clay. Therefore, it is unlikely that subsidence would be a factor in operations. Nonetheless, MID envisions that operations would include high accuracy Global Positioning System (GPS) monitoring of multiple locations on Madera Ranch before and during operation of the project. The elevations of on-site markers would be measured annually by MID and compared to distant USGS benchmarks to allow detection of any change in ground elevations. The MROC would monitor subsidence and has the authority to impose operational constraints or mitigation on the WSEP, depending on the level of impact, if any.

8.2.5 Preferential Use of Facilities and Swales

MID will generally use the Section 8 Canal (and its extensions), Gravelly Ford Canal, the swale in Sections 14 and 15, and the swale in Sections 2 and 3 for consistent, long-duration banking. The subsequent use of swales west of Gravelly Ford Canal will depend on pre-activity surveys of those swales. It should be noted that large water years have caused Cottonwood Creek to overtop in Section 28 and 29 and this could happen again prior to surveys. When the surveys are complete, MID will likely place water in Sections 28 and 29, and Sections 4, 5, 7, 8, and 9. The final swale system to be used would be the northern swales in Section 20. As described above under *Area of Inundation*, operations are proposed to follow a chronological order based on select deposition points; the priority numbers for each deposition point and its associated flow rate is illustrated in Figure 6. MID may adjust the use and priority of these deposition points over time based on recharge capabilities of various swale systems and other operational considerations.

8.2.6 Unintended Inundation

MID will walk the perimeter of Mitigation Area 1 and 2 during the creation of the rating curves and during the first two major banking events, which is when the maximum cfs is being applied to the particular swale abutting Mitigation Area 1 or 2, to determine if wetting of the mitigation areas is occurring. In the event water banking is visibly infringing on these mitigation areas after the first two banking events or at any other time, MID will have ditch riders close the release gates of the upstream deposition points and identify ways to ensure water does not enter Mitigation Area 1 or 2. This could include lowering release rates or installing a berm to direct flows. MID can respond to these conditions rapidly and water levels are expected to recede within several hours.

8.2.7 Emergent Vegetation Removal

MID will maintain its canals on an as needed basis. Generally, it is expected that emergent vegetation will need to be removed from the Section 8 Canal and Gravelly Ford Canal every 5 years. MID will use an excavator during the dry season and excavate and sidecast the soils onto the bank of the canals. Sidecast material will be placed on existing canal banks and will not be placed in previously undisturbed grassland. Emergent vegetation removal will not occur within the swales.

8.2.8 General Maintenance of Bottom and Banks

MID will periodically maintain the bottom and banks of its canals on ranch. Generally, it is expected that canals will need to be re-excavated or re-contoured once every 10–15 years. Depending on the percolation performance of Gravelly Ford Canal, the bottom of the canal may be ripped once every several years. Sidecast material will be placed on existing canal banks and will not be placed in previously undisturbed grassland. The lower reaches of Gravelly Ford Canal south of Section 16 have periodically, approximately every 15 years, received this type of maintenance, though the bottom has not been ripped because percolation was not an objective.

8.3 Pipelines, Pumps, and Lift Station

8.3.1 Seasonality of Installation and Maintenance

Pipelines, pumps, and lift stations will be installed during the dry season in accordance with MID's environmental commitments (Appendix A). The installation of these facilities will comply with MID's permit obligations, including avoidance and minimization measures for endangered species.

Maintenance of the facilities will occur primarily during the dry season. Wet season maintenance would occur only if a facility is not working properly to move water. Oils, lubricants, and other toxic materials will not be discharged over the grassland. Test water from the wells will preferentially be placed in the return pipeline, but limited amounts (i.e., less than 100 gallons) will be discharged to the grasslands.

Maintenance will typically consist of periodic testing of the pumps at the recovery wells to ensure they are operational, or replacement of pumps if they are not operational. Once constructed, no additional ground disturbance is anticipated for this maintenance.

Maintenance of the pipelines and electrical facilities to the wells would occur infrequently and only when necessary. Pipelines are not anticipated to need replacement over the life of the project. However, small areas could require re-excavation to repair pipes or electrical lines in trenches.

MID will follow measures outlined in its Spill Response Plan (Appendix F) avoid and minimize any potential contaminant spills that could occur during maintenance are immediately and completely cleaned up. The plan addresses:

- Training
- Proper management practices
- Spill control and clean-up procedures
- Notifications

8.3.2 Location of Facilities

Pipelines and pumps will be located in the grasslands to maximize the amount of water that can be extracted from recharge efforts. The construction of these facilities will be conducted in a manner to minimize potential effects to vernal pools, alkali rain pools, and listed wildlife species. No pipelines or pumps will be constructed in Mitigation Area 1 or 2. The Section 8 Canal northern extension will be constructed in Mitigation Area 1 between Sections 10 and 11.

8.3.3 Access to Facilities

Access to pumps will occur on existing roads to the extent possible. Overland travel should occur in a way to minimize the establishment of additional access roads unless site visits occur frequently enough to merit the same path be followed. Access considerations should be discussed with the resource agencies in Mitigation Area 3. MID will minimize travel in the wet season and avoid repetitive trips via the same route when traveling in upland.

8.3.4 Storage of Excess Equipment and Materials in MID Yard

MID will store most excess equipment and materials to support the water bank in MID's off-site operations yards. If MID stores some equipment and materials on site, these storage areas will occur in previously disturbed areas (i.e., ranch headquarters and operation yard).

8.4 Ponds

8.4.1 Ponds on Agricultural Lands

Construction, operation and maintenance of recharge ponds on agricultural lands are not expected to adversely affect endangered species. These facilities will be installed, operated and maintained to support water banking efforts.

8.4.2 Ponds on Grasslands

Construction, operation and maintenance of recharge ponds on grasslands could adversely affect endangered species. MID will implement its environmental commitments and mitigation measures to ensure these effects are avoided, minimized, and mitigated (Appendix A). Ponds and spoil piles will not be constructed on wetlands.

8.4.3 Pond Operation

If water is available for banking during summer months and ponds have been constructed, MID will preferentially use ponds to recharge water prior to using swales.

8.4.4 General Maintenance of Bottom and Banks

MID expects to need to maintain the bottom of the ponds after every 5th recharge cycle. This maintenance includes re-ripping the bottom of the pond. Periodically, MID will need to remove soil and sediment from the bottom of the ponds. This soil will be placed on designated soil disposal areas created during pond construction or trucked and disposed of off site.

9 Invasive Species Management

MID will implement a variety of invasive species management techniques depending on the need. Tools and techniques to address invasive wildlife and plants are described below. In general, MID, the conservation land manager, the Livestock Operator, and Grimmway will work to minimize the spread of invasive species throughout the property.

9.1 Wildlife

9.1.1 Bullfrogs

MID will conduct an annual survey of bullfrogs in canals and swales on Madera Ranch during the appropriate seasonal period of years that water is being banked on site. The survey will consist of 1-2 nights of inspections of on-site canals, swales, and the mitigation lands. If bullfrogs are found on the mitigation lands, the land conservation manager will be notified and a bullfrog eradication program will be implemented. The program will consist of regulating swale water over the season to ensure that water is not present year-round (this is unlikely because of percolation rates and water availability). It will also include up to 5 nights of manual gigging of bullfrogs or removal using other approved approaches in the mitigation area and areas immediately adjacent to the mitigation area. If air-powered pellet rifles are used, the user must be authorized for this activity through their DFG scientific collecting permit, notify the local DFG warden, and request a depredation permit from or notify the regional DFG fisheries biologist.

9.1.2 Coyotes/Dogs

MID and the livestock operator will only control coyotes as necessary in the non-mitigation areas and with the assistance of a biologist providing an educational training to staff proposed to do this work to ensure kit fox are not taken. The conservation land manager will control coyotes as necessary in the mitigation areas. Stray dogs will be taken to the County's Animal Control Shelter if possible.

9.1.3 Ground squirrels

MID and the livestock operator will not control ground squirrels within the mitigation area. Minimal controls will occur in other locations throughout Madera Ranch as necessary; these controls will be established with input from the resource agencies with the intent of avoiding and minimizing any direct and indirect effects to non-target species. Grimmway will control ground squirrels on their lands as needed, though MID will encourage them to eliminate their use of rodenticide.

9.1.4 Mosquitoes

MID will enter into an agreement with the Madera County Mosquito Abatement & Vector Control District (MCMAVCD) regarding a specific mosquito abatement program. The agreement will allow the MCMAVCD to access Madera Ranch and also will include quantitative abatement thresholds and financial compensation requirements for MCMAVCD activities, if necessary.

The MCMAVCD will monitor mosquito larvae production in the recharge basins, drainages, and distribution canals at no cost to MID, given that the amount of monitoring required is not excessive. Larvae populations will be tracked using methods and thresholds approved by the MCMAVCD, and

suppression measures will be employed when thresholds are exceeded and could become a threat to human health (Central Valley Joint Venture: Technical Guide to Best Management Practices for Mosquito Control in Managed Wetlands [June 2004]). Suppression measures may include environmental and biological methods, such controlling emergent vegetation, and applying larvacides. Larvacide controls will be used only as a last resort, and use of larvacides over open water will be minimized to the extent feasible, given the mosquito abatement mandate of the MCMAVCD. The laravacides that may be used are only those that are approved for such uses by the U.S. Environmental Protection Agency (EPA) and those approved for use in areas with threatened, endangered and special-status species. Care should be taken to ensure controls are not used in vernal pools.

If operations result in an increase in mosquito production such that an extensive monitoring program is needed, MID will hire a professional pest control service and will bear the cost of that service.

9.2 Plants

MID will conduct an annual survey of plant species on Madera Ranch including the mitigation area. If a highly invasive species is found in the mitigation area, MID will notify the conservation land manager and consult local experts including the agricultural commissioner or local weed management authority. The conservation land manager will work with these experts to implement a control program. The control program will consist of manual removal, controlled burns, and herbicide application depending on the invasiveness of the species, the size of the infestation, and effectiveness of other treatment measures. Local, state and federal regulations will be complied with when implementing controlled burns or applying herbicides, and the resource agencies will be notified before implementing a controlled burn program in or near the mitigation area. Vernal pools will be avoided by a minimum 250 foot buffer when applying herbicides and a biological monitor will be present during the application of herbicides to ensure sensitive resources (i.e., plants or wildlife) are not adversely affected.

The following best management practices (BMPs) will also be used on site to help reduce the spread of noxious weeds.

1. **Plan/use integrated vegetation management (IVM)—**Incorporate a strategy of integrated vegetation management.
2. **Educate/train/notify—**Provide training to management and workers on the identification of noxious weeds, the importance of noxious-weed control, and measures to minimize their spread. Update weed location information as new data become available.
3. **Treat weed sources before project—**Identify existing noxious weeds along access roads and remove or treat seed sources and other viable reproducing plant parts before equipment moves in to relatively weed-free areas.
4. **Use weed-free materials (e.g., gravel, straw, and fill)—**Avoid moving weed-infested gravel, rock, and other fill materials to relatively weed-free locations. Fill should come from weed-free sources. Use only certified weed-free straw and mulch for erosion-control. Maintain stockpiled, uninfested material in a weed-free condition.
5. **Road travel—**Keep vehicles on roads to limit weed spread.

6. **Work in uninfested-to-infested direction—**Work in a direction from uninfested areas to infested areas.
7. **Minimize ground disturbance—**Minimize soil disturbance and the removal of roadside vegetation during construction, maintenance and other ground-disturbing activities.
8. **Minimize contact/stage in weed-free areas—**Minimize contact with roadside sources of weed seed that could be transported to other areas. Stage in areas not infested with weeds.
9. **Monitor/treat infestations when small/early detection rapid response (EDRR)—**Quickly treat individual plants or small infestations before they become established, produce seed, or are able to spread. Monitor these areas to ensure that control was effective.
10. **Proper disposal of removed weeds—**Dispose of weeds in an appropriate manner. Do not chip noxious weeds and use them as mulch.
11. **Revegetation/seeding (using native or non-invasive plants)—**Use native plants where available for revegetation and seeding. Retain native vegetation in and around project activity to the maximum extent possible.

10 Species Monitoring and Management

Active endangered species monitoring and management will occur within the mitigation lands and will be conducted by the conservation land manager. Species monitoring procedures and locations are illustrated in Figure 8.

10.1 Mitigation Land Associated Species Monitoring

10.1.1 Wildlife

Within the mitigation lands, an annual wildlife survey will be conducted two times per year every 10 years. The surveys will be conducted between December 15th and February 15th and between April 15th and July 15th. The surveys will consist of 2–3 days of walking transects along set alignments. Transect locations are illustrated in Figure 8. Winter surveys will focus on avian use of the property and spring surveys will focus on amphibian, reptile, and mammal use of the mitigation area. MID will allow USFWS, DFG or their designees to conduct additional endangered species surveys within the mitigation area.

Invertebrates

Invertebrate surveys will be conducted annually within the mitigation area for the first 3 years during appropriate normal or wet water years. After these surveys, species presence will be monitored every 10th year. Surveys will be conducted 30 days after the season's first significant rains, typically between January 15 and March 15. Surveys will consist of dip netting a minimum of 10 vernal pools in the mitigation area and a minimum of 10 vernal pools outside the mitigation area (depending on the size of the pools and proximity to one another, more will likely be able to be sampled). Data will be collected from vernal pools in swales used for recharge and from vernal pools in swales not used for recharge, with at least 5 data points representing each. Data will be collected on pool temperature, pH, depth, size, and clarity. Larger pools that could contain California tiger salamander larvae will also be seine netted. Sample data collection locations are illustrated in

Figure 8. With agency approval, these data collection locations could be adjusted over time to maximize the value of the data collection effort. Additional data will be collected on areas with restored vernal pools.

Management will continue to facilitate the preservation of the vernal pools. Management actions will primarily relate to modifying the grazing objectives and ensuring invasive species do not colonize vernal pools.

Amphibians

Dipnet surveys (when breeding conditions permit) will be conducted by a wildlife biologist with the appropriate ESA Section 10(a)2(b) and State scientific collection permits within the mitigation area for 3 years during appropriate normal or wet water years for CTS. After these surveys, species presence will be monitored every 10th year. The surveys can be conducted in tandem with the vernal pool invertebrate surveys described above.

An annual survey for exotic aquatic predators (bullfrogs, mosquito fish) will be conducted in waters on the Madera Ranch lands.

Reptiles

Early summer surveys will be conducted during the appropriate temperature window to detect blunt-nosed leopard lizards. Transect locations are illustrated in Figure 8. As described under *Wildlife*, transects will be walked between April 15th and July 15th when the temperature is between 77-95 degrees at 1 cm above ground surface every 10th year. Information on the location and habitat conditions associated in any sightings will be recorded in an annual report.

Management will continue to facilitate the preservation of grassland habitat on Madera Ranch. Management actions will primarily relate to modifying the grazing objectives and ensuring invasive species (i.e., plants or amphibians) do not colonize grasslands. Blunt-nosed leopard lizard may benefit from additional structural habitat restoration; and native shrubs may be planted in the mitigation area in the future.

Birds

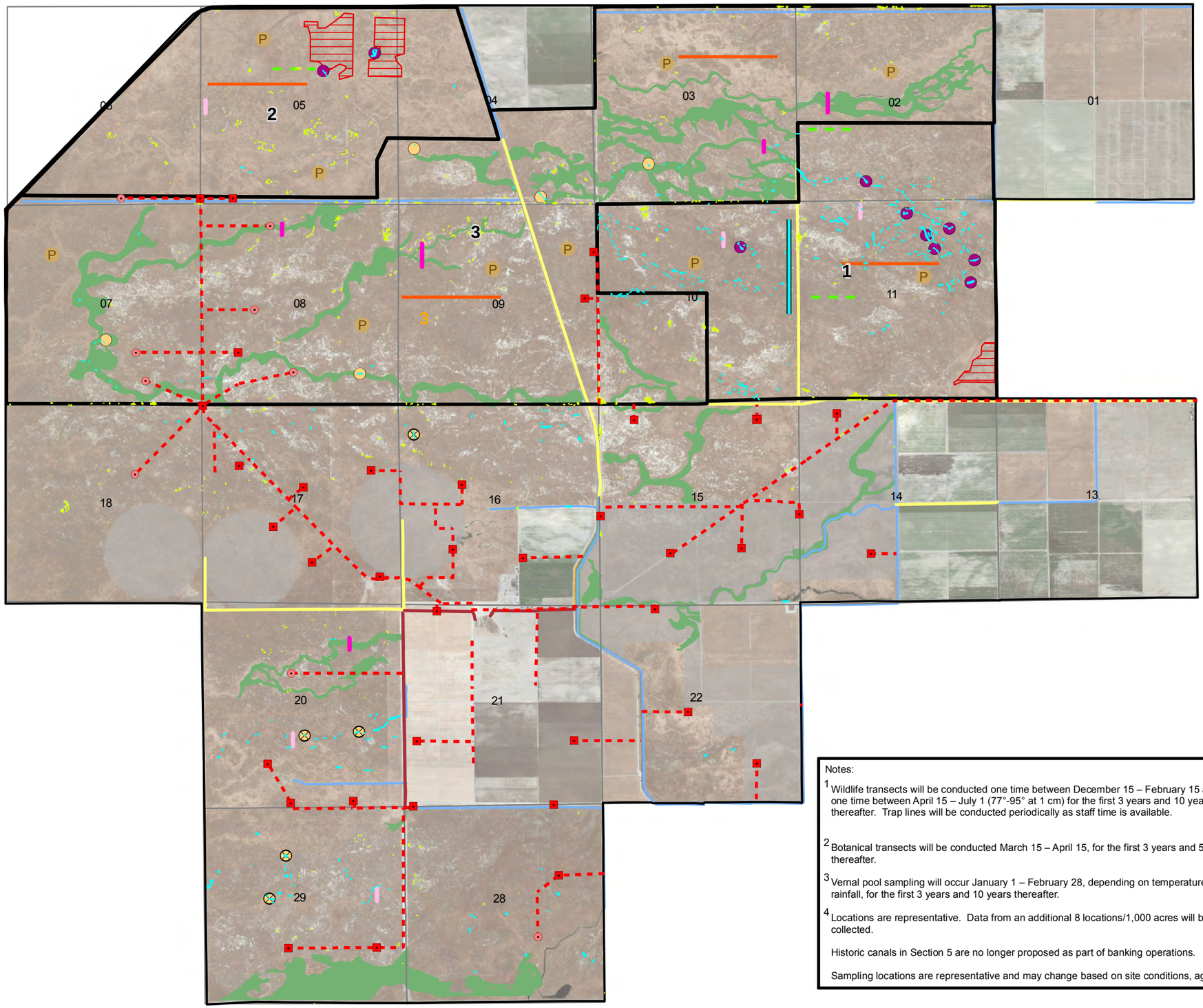
Ducks and Shorebirds

Whenever wildlife surveys are conducted on Madera Ranch information will be collected on the species observed on site. Access will be granted to mitigation lands to organizations wishing to conduct more detailed bird counts. No explicit duck and shorebird management goals are proposed at this time.

Western Burrowing Owl

Whenever wildlife surveys are conducted on Madera Ranch information will be collected on the species observed on site. Access will be granted to mitigation lands to organizations wishing to conduct more detailed bird counts. Management of the grasslands at the heights indicated are expected to benefit western burrowing owl.

Figure 8
Mitigation Areas and Sampling Locations



Wildlife Survey Areas[1]
- Proposed Wildlife Transects
- Proposed Trapline

Botanical Survey Transect of Swales[2]
- Not used for Banking
- Used for Banking

Vernal Pool Sampling Locations[3]
- Inside Mitigation Area
- Inside Swales Used for Banking
- Outside Swales Used for Banking
- Vernal Pool Monitoring (2 Years)

Grazing Monitoring[4]
- Permanent Forage Monitoring
- Mitigation Areas 1-3
- Possible Vernal Pool Restoration/Creation Areas

Water Banking Facilities
- New Wells* (Optimistic Analysis)
- New Wells (Conservative Analysis)
- Section Index
- Phase 2 Recharge Areas
- Swale Recharge Area
- Ranching facilities
- Pipeline
- Canal
- Canal Improvements
- Lateral Improvements
- Alkali Rain Pool
- Vernal Pool

* The actual number and locations of new wells may vary from those depicted here, following detailed engineering design and adjustment during staged installation. For the purposes of this document, it was assumed that all wells depicted in this figure may be constructed and/or used.

Notes:

[1] Wildlife transects will be conducted one time between December 15 – February 15 and one time between April 15 – July 1 (77°-95° at 1 cm) for the first 3 years and 10 years thereafter. Trap lines will be conducted periodically as staff time is available.

[2] Botanical transects will be conducted March 15 – April 15, for the first 3 years and 5 years thereafter.

[3] Vernal pool sampling will occur January 1 – February 28, depending on temperature and rainfall, for the first 3 years and 10 years thereafter.

[4] Locations are representative. Data from an additional 8 locations/1,000 acres will be collected.

Historic canals in Section 5 are no longer proposed as part of banking operations.

Sampling locations are representative and may change based on site conditions, agency

0 0.5 1
Miles

N

K:\Projects_KMD\05120_05\mapdocs\Mitigation\Figure 8_Mitigation Areas and Sampling Locations_20110601.mxd (KBA June 1, 2011)

Mammals

Small mammal trapping would be conducted by a wildlife biologist with the appropriate ESA Section 10(a)2(b) and State scientific collection permits every 10th year; trapping is proposed infrequently because of extensive trapping conducted to date and no confirmed captures of listed small mammals. Possible trapline locations are illustrated in Figure 8; actual trapline locations will likely be based on burrow density and follow the recommendations of the permit holder with agency concurrence. Spotlighting will occur for kit fox every year for the first 3 years and every 10th year thereafter. Spotlighting will occur for 3 nights to make incidental observations of potential presence. If additional staff time is available additional surveys will be conducted. No explicit mammal management goals are proposed at this time.

10.1.2 Plants

The conservation land manager will map rare plant communities within the mitigation area during the first several years of botanical surveys, with representative sampling and counts during subsequent monitoring periods to determine plant associations and changes over time. The data will be summarized in an annual report. Grazing and invasive species management actions are expected to benefit rare plant species.

10.1.3 Management Response

The conservation land manager will use the data collected during surveys to inform annual management decisions and recommendations to the Livestock Operator and MID. If the data collected indicate a change in wildlife abundance or rare plant communities, the land manager will try to determine the cause (i.e., natural variability, level of grazing, water banking) and identify appropriate responses. The primary management responses are expected to be altering grazing practices, modification of water banking practices, and/or invasive species control.

10.2 Water Banking Associated Species Monitoring

10.2.1 Wildlife

Wildlife surveys are primarily oriented around ensuring adverse effects from water banking are not greater than those anticipated in the associated project permitting documents.

Invertebrates

Invertebrate monitoring will be conducted by the conservation land manager to ensure consistent data acquisition (see above).

Amphibians

As described above, MID will conduct an annual survey of bullfrogs in canals and swales on Madera Ranch during the appropriate seasonal period of years that water is being banked on site. The survey will consist of 1-2 nights of inspections of on-site canals, swales, and the mitigation lands. If a significant number of bullfrogs are found on the mitigation lands (i.e., 20% above the first year survey), the land conservation manager will be notified and a bullfrog control program will be implemented.

Reptiles

Additional blunt-nosed leopard lizard surveys will be implemented prior to construction of linear facilities and ponds and prior to use of the swales. These obligations are outlined in MID's environmental commitments (Appendix A).

Birds

Avian surveys are proposed prior to construction and these obligations are outlined in MID's environmental commitments (Appendix A).

Mammals

Small mammal surveys are proposed prior to construction on the west side of the property and these obligations are outlined in MID's environmental commitments (Appendix A).

10.2.2 Plants

Five vegetation evaluation transects will be established across swales being used for banking and the same number of transects will be established in swales not used for banking. The length of the transect should include at least 100 feet on each side of the swale. Data from these transects will be compared to evaluate changes in the vegetation community within and adjacent to the swales over time. These transect locations are illustrated in Figure 8.

MID will conduct an annual survey of plant species on Madera Ranch including the mitigation area. If a highly invasive species is found in the mitigation area, MID will notify the conservation land manager and consult local experts including the agricultural commissioner or local weed management authority to develop and implement a control strategy.

MID will evaluate the nearest downstream wetlands from the Section 8 canal northern extension for the first 5 years of project implementation. The area will be visually inspected during the rainy season to ensure there is no erosion or sedimentation that is being conveyed to the nearby vernal pools. If sedimentation is detected, MID will notify the resource agencies, propose a restoration approach, institute the restoration approach based on resource agency input, and conduct additional monitoring to ensure effects do not persist. MID will also compare baseline winter aerial photos with post-project aerial photos to ensure the downstream vernal pools continue to pond. In the event adverse effects persist, MID will work with the resource agencies to ensure these effects are mitigated.

10.2.3 Management Response

MID will use the data collected during surveys and recommendations from the land conservation manager to inform annual management of its water banking activities. If lateral movement is detected that is encroaching on mitigation Area 1 or Area 2 and there are adverse effects to species habitat, then MID will make operational changes to ensure lateral movement does not continue. Additionally, MID may also reprioritize the priority use of swales and facilities to minimize effects on listed species and sensitive habitats.

10.3 Other Management Actions

The conservation easement holder and conservation land manager may allow other enhancement opportunities with the mitigation lands, provided the actions are approved by USFWS, DFG, Reclamation and the Corps. Similarly, reintroduction of endangered species would be allowed on the mitigation land.

11 Vernal Pool Restoration and Management

11.1 Responsible Parties

MID is the responsible party for ensuring the terms of its permit are fulfilled. MID has contracted with Vollmar Consulting to fulfill its vernal pool restoration and management obligations. A detailed vernal pool restoration plan is currently undergoing agency review (Vollmar 2011) and the contents of that plan will supersede the information provided below; this plan is included in Appendix X.

11.2 Mitigation Design

11.2.1 Location

The 50-acre area in the southeast of mitigation Area 1 is proposed for vernal pool creation/reestablishment. This location was selected because it was previously cultivated but does not appear to be subsoiled. It appears to have the appropriate soils to support vernal pool creation/reestablishment. An additional 50-acre site is located in Section 5, mitigation Area 2 will also be used for creation/reestablishment as this location also appears to have appropriate soils to support additional vernal pool creation.

11.2.2 Basis for Design

The restoration design objective is to obtain a vernal pool density class of approximately 10% of created/reestablished vernal pools. The design is similar to existing vernal pool densities in the northeastern portion of Section 11. Wetlands will only be created in areas with appropriate soils and where the hardpan is intact. Historic aerials will also help influence design decisions.

11.2.3 Characteristics of Design Reference Site

Vernal pools in the northeastern portion of Section 11 will be used as reference pools. These have a median size of 0.04 acre and a maximum size of 1.3 acres. They have not been sampled for fairy shrimp but are expected to provide this key aquatic function and were observed during the wetland delineation. Wetland hydrology of Madera Ranch vernal pools differs from the hydrology of typical vernal pools; at Madera Ranch, the vernal pool soils do not have an identifiable restrictive layer above which a perched water table is present. Ponding appears to be attributable to very low permeability at the soil surface or in the upper soil horizons. The vernal pools with longer ponding duration appear to have the most clay present in the soil, with a clay Bt horizon. The duration of ponding depends primarily on the amount and timing of rainfall. Topography varies little with approximately 5-foot elevation decline across 1 mile. Soils include a variety of associations, but in the reference area include Pachappa Series, Traver Series, and Dinuba, El Peco, and Fresno Series.

Vegetation includes common species of the California annual grassland community, and within the vernal pools includes Mediterranean barley (*Hordeum marinum* ssp. *gussoneanum*), coyote thistle (*Eryngium vaseyi*), Fremont's goldfields (*Lasthenia fremontii*), California water-starwort (*Callitriche marginata*), bracted popcorn flower (*Plagiobothrys bracteatus*), mousetails (*Myosurus minimus*), Pacific foxtail (*Alopecurus saccatus*), and American pillwort (*Pilularia americana*).

11.2.4 Proposed Mitigation Site

The site will be part of a larger mitigation area for the project. This area will be placed under conservation easement with CRT and managed by a conservation land manager. There are currently no jurisdictional areas located in the proposed vernal pool creation/reestablishment area, and it does not provide aquatic function other than rainwater percolation. The hydrology is similarly rainfall-based and the topographic profile is also very small. Soils include the Traver Series and Tujunga Series. There is a hardpan layer 2 feet below the surface. Vegetation currently is California annual grassland species. The 50-acre area is fenced and ungrazed; historically, it was cultivated. There are grazed lands to the north and east of the site, and this will continue in perpetuity with the conservation of these lands as mitigation for the project. Land to the east is in orchards and to the south is in carrots, and these uses are likely to continue. The second creation location is surrounded by undisturbed grassland and will be part of a larger upland preservation effort to support mitigation for the project.

11.2.5 Created/Restored Habitat

MID is proposing a compensation ratio of 5:1 for project effects on vernal pools and alkali rain pools, consisting of 3:1 preservation and 2:1 creation. Alkali rain pools creation/reestablishment values are proposed to be mitigated out-of-kind because alkali rain pools are unique and infeasible to create/reestablish because of their specific soil chemistry. Some preservation of alkali rain pools will occur on site, but vernal pool preservation and creation/reestablishment will be the primary habitat conservation objective because of its increased likelihood to support listed fairy shrimp. The goal is to create/reestablish 7 acres of vernal pools that achieve their performance criteria. The vernal pools will mimic the reference pools in their aquatic function, hydrology, and vegetation. Local soils will be used to create/reestablish this habitat.

11.3 Restoration Procedures and Implementation Plan

A qualified biological monitor will be present when wetland mitigation is being created, including preparation, grading and seeding.

11.3.1 Site Preparation

Substantial amounts of site preparation are not anticipated. The vernal pool restoration and design contractor will conduct additional assessment of the soils and hydrology and calculate soil movement volumes. They will develop a GIS-based preliminary design and submit this for resource agency review and approval. Upon approval of the design, the design contractor will conduct pre-construction surveys, install exclusion fencing on the north side of the site, and begin grading.

11.3.2 Grading

Minor topographic grading will be required to ensure appropriate vernal pool depth and natural land-form contours.

11.3.3 Planting/Seeding

The restoration contractor will seed the non–vernal pool portions of the restoration site with a local, weed-free California annual grass seed mix. The restoration contractor will use an industrial vacuum cleaner or similar device to obtain inoculate from vernal pools in the northern portion of Section 11 to use to seed the vernal pools; no more than 50% of the source pools will be vacuumed.

11.3.4 Irrigation

No irrigation of the creation/reestablished vernal pools is proposed. Performance criteria below include hydrologic objectives.

11.3.5 Implementation Schedule

The implementation schedule is illustrated in Table 8.

Table 8. Vernal Pool Creation/Reestablishment Schedule

Date	Task
January 2011	Conduct remaining studies and prepare preliminary design
March 2011	Agency review of design
April 2011	Finalize design
June 2011	Begin construction
August 2011	End construction
October 2011	Begin monitoring

11.4 Performance Criteria and Monitoring

11.4.1 Performance Criteria

Performance criteria used for the evaluation of the vernal pool creation/reestablishment efforts are consistent with those used for similar mitigation projects. They include monitoring of the following variables:

- hydrology (including depth, duration and extent);
- erosion (unanticipated effects);
- vegetation (including relative cover and absolute cover);
- aquatic invertebrates (including relative abundance and species richness); and
- acreage.

The intent is to ensure that the vernal pools are functioning wetlands. These variables are further illustrated in Table 9 and are subject to final approval by the resource agencies.

Table 9. Monitoring Performance Standards for Created/Reestablished Vernal Pools

Monitored Characteristics	Monitoring Year	Performance Standards	Timing
Hydrology—ponded depth	1–5	Demonstrate ponded depth similar to reference vernal pools (85% of created pools pond at least as deep as reference pools). Estimate of duration of ponding to be based on staff gage readings.	Nov. 1–June 15 (wet season)
Hydrology—area of ponding	1–5	Demonstrate area of ponding is consistent with acreage requirement. Estimate based on aerial photo review or perimeter survey.	Nov. 1–June 15 (wet season)
Hydrology—duration of ponding	1–5	Demonstrate duration of ponding similar to reference vernal pools (85% of pools pond at least as long as reference pools). Collect data on number of days ponded; can also measure soil saturation.	Nov. 1–June 15 (wet season)
Erosion	1–5	Demonstrate erosion is not a problem. Assess site and note areas of erosion from hydrology, cattle or human activities.	Nov. 1–June 15 (wet season)
Vegetation—absolute cover by plant species	1–5	Ensure absolute vegetative cover at least 85% as dense as the reference pools. Record data annually using transects and collecting data on absolute cover.	Mid-March through May (flowering period) following first year of pool inundation
Vegetation—relative percentage of cover by dominant plant species	1–5	Ensure greater than 50% of the dominant plant species are comprised of hydrophytes and relative cover is at least 85% as similar as the reference pools. Record data annually using transects and collecting data on relative cover.	Mid-March through May (flowering period) following first year of pool inundation
Invertebrates—relative abundance	1–5	Ensure relative abundance of invertebrates is at least 80% as abundant as the reference pools. Dip-net using USFWS approved sampling methods.	Wet season
Invertebrates—species richness	1–5	Ensure species richness is 80% of other aquatic species observed in the reference pools. Dip-net using USFWS approved sampling methods.	Wet season

11.4.2 Monitoring

The primary purpose for monitoring and reporting are to document progress toward successful creation/reestablishment. Regular monitoring allows the restoration contractor to identify corrective actions and changes in management, and evaluate progress toward the performance criteria. Monitoring will occur according to the schedule illustrated in Table 9.

11.5 Maintenance during Monitoring Period

11.5.1 Maintenance Activities

Maintenance activities are limited, but could include maintenance of perimeter fencing to seasonally exclude cattle, install and maintain monitoring devices, and take corrective actions, as necessary, such as minor earth movement, installing sediment fencing, or controlling invasive species.

11.5.2 Maintenance Schedule

The site will be visited monthly, or more frequently during the wet period, during the first 5 years to determine whether maintenance issues arise. Once the site is performing as desired, the conservation land manager will assume responsibility for long-term maintenance.

11.6 Proposed Monitoring Reports

11.6.1 Due Dates

Monitoring reports associated with the creation/reestablishment effort will be submitted annually to the Corps, USFWS, and DFG for the first 5 years until the restoration is successful and functions independently for 3 years. These reports will be provided July 1 each year, beginning in 2012.

11.6.2 As-Builts

The restoration design contractor will provide a copy of the as-built drawings within 30 days following construction.

11.6.3 Annual Reports

Monitoring reports will include basic project information (including project file number), compensatory mitigation site information, site and location maps, success criteria, tabulated results of monitoring visits (including previous years and success criteria), problems noted and proposed remedial measures, and appendices (data sheets and photos). This report will generally follow the outline provided by the Corps in its guidance.

11.7 Potential Contingency Measures

Potential contingency measures are intended to support corrective actions in the event the creation/reestablishment does not proceed as anticipated. Example contingency measures could include:

- supplemental seeding in vernal pools,
- regrading a portion of the site if hydrologic functions are not achieved,
- identifying and developing additional on-site creation/reestablishment opportunities,
- identifying and developing off-site opportunities, and
- purchasing vernal pool creation credits.

11.7.1 Initiating Procedures

MID or the restoration contractor will contact the Corps, USFWS, and DFG if contingency measures are needed. They will meet with these agencies to discuss contingency options and prioritize contingency measures.

11.7.2 Contingency Funding Mechanism

MID or the restoration contractor will ensure the performance criteria are achieved. They will secure insurance or a performance bond to allow them to take corrective actions if necessary.

11.8 Completion of Mitigation Responsibilities

11.8.1 Notification

MID or the restoration contractor will notify the Corps when it believes it has fulfilled the mitigation responsibilities associated with vernal pools. A final report will be prepared, and the letter will request concurrence from the Corps.

11.8.2 Corps Confirmation

The Corps will provide written confirmation as to whether the vernal pool mitigation obligations have been achieved or additional corrective actions are needed. If the obligations have been achieved, long-term management will be the responsibility of the conservation easement holder and conservation land manager.

11.9 Long-Term Management

11.9.1 Ownership

The owner of the property will likely continue to be MID, though a perpetual conservation easement will regulate and restrict uses on the site in perpetuity. The primary use of the mitigation area will be species, habitat and wetland protection, and wetland habitat preservation and restoration.

11.9.2 Management

The property owner (currently Madera Irrigation District) will be responsible for upland mitigation and vernal pool mitigation lands. The owner will ensure that the property will be managed consistent with this plan and the adaptive management measures outlined herein.

11.9.3 Site Protection

The site will be protected through fencing, management, and a perpetual conservation easement. Fencing will be maintained in good working order. Signage will be placed on the perimeter, or nearest fenced portion, of the mitigation area and will indicate the mitigation lands are to be managed for wetland and wildlife habitat in perpetuity. Other site-protection conditions include:

1. Discing shall not be allowed in the mitigation area;
2. Chemical use on mitigation areas must receive advance approval from the resource agencies;

3. Damage to the mitigation area caused by the Livestock Operator, staff, contractors, or neighboring property owners shall be documented in the annual reports and recommendations for solving these problems will be included in the report;
4. New leasees shall be made aware of the requirements of the project and mitigation areas before signing a lease;
5. Permanent photo stations will be established and photos taken annually.

12 General Habitat Enhancement

12.1 Fencing

No additional fencing is proposed. However, limited new fence construction could occur within mitigation lands to support the evaluation and treatment of additional habitat/species hypotheses or research needs. No restrictions on fencing will occur within non-mitigation lands.

12.2 Seeding

No additional seeding beyond habitat restoration association with the project is proposed. However, seeding of native species could occur within mitigation lands if deemed appropriate by USFWS and DFG. Seeding may be proposed for areas where vegetation is not resprouting due to heavy cattle use. The conservation land manager will prepare a brief summary of any proposed seeding plans, including information on where it will occur, where the seed will come from, what the mix of seed will be (native species mix only), and how the seeding will be conducted, for agency review prior to seeding.

12.3 Planting

Planting of non-native species will be prohibited in the mitigation lands. Planting of native species may occur if deemed appropriate by USFWS and DFG. Planting of some native species could create additional habitat complexity and diversity. Plants would likely need to be protected from cattle to increase their survivorship.

12.4 Mowing/Scraping

If grazing does not occur within the buffer land between the grassland and agricultural lands within the mitigation area, the area may be scraped to minimize fire danger. The conservation land manager could scrape a fire brake (down to just bare mineral soils - or black line) to reduce fire danger to adjacent property. Scraping is proposed because it does not disturb the below ground integrity of burrows, can be done outside of the active season for aestivating species if a biological monitor(s) walks ahead of machinery. The biological monitor will ensure the avoidance of sensitive resources (i.e., native plants, active burrow complexes, vernal pools, swales).

12.5 Invasive Control

Invasive plant species control will occur as needed throughout the property. Invasive species will be controlled with focused manual removal or herbicide application depending on the size and severity

of the infestation and the management approach developed as identified in Section 9.2; application will be made by a licensed applicator and following the label instructions. The land conservation manager must approve any application in the mitigation lands or be the applicator. Special care will be used to minimize potential herbicide drift to areas with other sensitive plants or wetlands.

13 Agricultural Management

13.1 Relationship to Adjacent Agricultural Users

MID will meet with adjacent agricultural users if there appear to be activities that encroach on Madera Ranch or the mitigation area.

13.1.1 Grimmway

Grimmway is the current owner of the nearest farming operation and also has transportation access through Madera Ranch. Large farming vehicles will not be allowed in the mitigation area. Herbicide will not be applied along fencelines, including the setback fence, within the mitigation lands. MID will discuss with Grimmway the importance of minimizing pesticide, herbicide, or fungicide drift onto mitigation lands.

13.1.2 Other Farmers

No other tenant farmers are currently using Madera Ranch. However, should Grimmway (or the subsequent landowner of this nearby farming operation) lease its land to others, MID will provide them with a copy of this Mitigation and Management Plan and a list of obligations, should they need to enter other portions of the property. The Pope family manages the agricultural lands in Section 12 outside the ranch boundary. MID will discuss with the Pope family the importance of minimizing pesticide, herbicide, or fungicide drift onto mitigation lands.

13.1.3 Exclude Tailwater Runoff

MID will meet with Grimmway and prospective farming tenants to ensure tail water runoff is not conveyed onto the mitigation lands.

14 Monitoring and Management Related to Grazing

The monitoring program will provide a means to measure achievement of the performance standards for grazing based on specified variables and methods. The monitoring program will provide an accurate assessment of the balance between forage supply and utilization, as well as measures of other resource conditions, to assure that cattle stocking rates, schedules, and other grazing practices are achieving the conservation and livestock production goals. It will provide the basis for adjustment of the estimates of future forage production and utilization, conservation, and grazing practices. It is important to note that this monitoring program requires measurements supplementary to those ordinarily measured for livestock production purposes alone, to accommodate the conservation goals. The plan uses a combination of sampling and photographic stations to provide the most useful records and analyses.

The mitigation area was designated to maintain and enhance habitat for special-status natural communities, plants, and animals using livestock grazing. Therefore, special status-natural communities and plants should be monitored by a botanist, special-status animals should be monitored by a qualified wildlife biologist, and rangeland health should be monitored by a Certified Rangeland Manager (though the rangeland manager may train MID staff or the conservation land manager in data collection to minimize their annual costs).

Four types of monitoring are to be conducted in combination:

- Compliance monitoring: Compliance monitoring determines whether the grazing prescription was followed by the Livestock Contractor (SRCD 2006). This monitoring will be conducted by asking the Livestock Operator questions from a basic compliance questionnaire.
- Rangeland ecosystem health monitoring: Rangeland ecosystem health monitoring determines whether soils, vegetation, water, and overall ecological processes are being maintained over time (Pellant et al. 2005). The herbaceous foliage, soils, pest plants, and unplanned disturbance variables listed in Table 10 measure rangeland ecosystem health. The monitoring should be conducted by the conservation easement holder, conservation land manager, or a competent third party certified in rangeland management, who understands the complexities of grazing and its effects on special resources, and can provide a credible assessment.
- Livestock operation sustainability monitoring: Livestock operation sustainability monitoring will help determine if the livestock operation will be sustainable in the long-term. A questionnaire directed to the Livestock Operator will be used to measure this variable. Types of questions include whether Livestock Operator enjoys ranching; whether it is profitable to graze at Madera Ranch; and whether the Livestock Operator has a good working relationship with MID and regulatory agencies. The compliance monitoring and livestock operation sustainability monitoring questionnaires should be conducted at the same time.
- Grazing effects characterization monitoring: Grazing effects characterization monitoring (or effectiveness monitoring) determines whether the management goals and objectives were achieved by the grazing prescription (SRCD 2006). The effectiveness monitoring must include assessments of the effects of the grazing and related management on the status of the special-status natural communities and special-status plant populations by a qualified botanist. A qualified wildlife biologist must assess the effects of the grazing and related management on the status of the special-status animals.

The associated management program will provide the means to make needed modifications to the grazing prescription to achieve the performance standards based on the decision "triggers" discussed below.

14.1 Monitoring Variables, Methods, and Schedule Related to Grazing

The monitoring program is limited to a minimum set of variables, schedule, and reporting that will achieve the monitoring objectives while being reasonably limited in requirements for personnel time (Table 10 and Table 11). Consequently, the sampling will be too small to be statistically robust, but instead will rely on "professional judgment" to achieve representation of the landscape's variety. The Livestock Operator will perform basic and regular field observations, assessments, and reporting to the best of their ability. The more technically demanding elements of the monitoring

and the data analyses, management assessments, recommendations for adaptations to the grazing plans, and formal reporting will be performed directly by the conservation easement holder, land conservation manager, or under supervision of MID and may be phased to accommodate funding availability.

Monitoring will include a minimal set of indicator variables (quantitative and observational) to assess performance toward the standards for each objective. All the herbaceous variables and most of the other variables focus on the herbaceous vegetation of the grasslands. Temporary sampling stations will be used for all variables to achieve a systematic representation of the grazeable areas. Selected photography will record significant impacts on special resources and problems. Permanent stations for repeated photography will provide a visual record and reference for general rangeland conditions and wildlife habitat parameters. The photography stations will be determined by the conservation land manger after careful review of available vistas and study of photo-monitoring guidelines (e.g. Hall 2002).

Table 10. Annual Monitoring Responsibilities of the Conservation Land Manager

Variable (units)	Method	Timing	Mitigation Area
Herbaceous Foliage			
Phytomass—RDM (pounds/acre)	Ten monitoring locations for each 1,000 acres; 5 locations will include permanent transects. and two of these will be used for clipping and weighting RDM inside a 0.94 ft diameter sampling hoop. The remaining eight transects will be sampled using a 0.94 ft diameter sampling hoop to estimate absolute cover (percent).	Late fall (before the first precipitation event – late October or early November)	X
Height (inches)—1	Obtain an average from the transects above; determine average forage height (top of foliage mass, not grass inflorescence) of each site within one yard radius circle by visual comparison with yardstick; alternatively, the “effective height” or obstruction of herbaceous mass may be measured with a Robel pole or Barclay obstruction board.	Late fall	X
Special-Status Natural Communities, Plants, and Animals (species, locations, status):	Visually monitor existing populations of special-status natural communities, plants, and animals for evidence of excessive livestock damage, such as herbivory, mortality, and reduction of density (in cooperation with a qualified botanist and wildlife biologist).	Annually for the first 5 years and every 5 years thereafter	X
Grazing Exclosures	Note timing of livestock access to buffers along crop fields, canals, and riparian woodlands.	Maintain a log during visits	X
Soil Erosion (location; severity; changes)	Map and record descriptions of status of sites of significant erosion; assess status; photograph significant changes.	Once in late spring	X

Variable (units)	Method	Timing	Mitigation Area
Pest Plants (species, locations, status)	Map general distributions of high-priority pests on a baseline property map; assess status of these infestations; photograph significant changes. Record notes on treatments applied and their effects.	Once in late spring	X
Unplanned Disturbance (type; date; location; severity)	Record descriptions of events (e.g. fires, infestations, vandalism) with dates, locations, and judgments of importance and effects; photograph significant changes.	Maintain a log for the year	X
Livestock Use	Note the locations of any under or over-utilization patterns.	Maintain a log for the year	X
Illustrative Views	Establish stations for repeated photo documentation at permanently marked locations that represent each GMU, plus banks of creeks and canals, watering facilities, and fencelines with adjoining properties.	Photograph stations – spring and late fall; maintain log	X
Operational Feasibility and Cooperation	Review accomplishments (prioritization and development of recommended infrastructure improvements; prompt responses to requests for cooperation and maintenance of infrastructure; reporting on schedule; exchange of relevant technical literature for education; support of joint participation in professional organizations; engage both parties in the monitoring and adaptive management); note improvements needed.	Spring	X

Table 11. Annual Monitoring Responsibilities of the Livestock Operator

Variable (units)	Method	Timing	Mitigation Area
Herbaceous Foliage			
Unplanned Disturbance (type; date; location; severity)	Record descriptions of events (e.g. fires, infestations, vandalism) with dates, locations, and judgments of importance and effects; photograph significant changes.	Maintain log for the year	X
Actual Livestock Use (types and numbers)	Record schedule of livestock types and numbers present at each Grazing Management Unit, and any under or over-utilization patterns.	Maintain log for the year	X
Infrastructure (type, location, condition)	Record the type, location, and condition of fences, gates, roads, trails, stream crossings, watering facilities, corrals, and other facilities that are in need of repair.	Maintain log for the year	X
Operational Feasibility and Cooperation	Review accomplishments (prioritization and development of recommended infrastructure improvements; prompt responses to requests for cooperation and maintenance of infrastructure; reporting on schedule; exchange of relevant technical information; ; note improvements needed	Spring	X

Specific assignments, monitoring protocols, data forms, analysis procedures, and record keeping and reporting procedures will be re-evaluated and determined at the conclusion of this preliminary monitoring. Conducting some of the simpler monitoring jointly by the conservation land manager, MID and the Livestock Operator periodically would foster agreement on monitoring methods, and mutual identification of problems and potential adjustments of management practices.

14.2 Analysis of Grazing Related Monitoring

The conservation land manager will enter the monitoring data (including that provided by the Livestock Operator) into simple spreadsheets, conduct simple analyses, develop the summary tables, make the professional judgments noted above, and prepare the summary annual report. The conservation land manager, MID, and the Livestock Operator will periodically conduct conference calls regarding the monitoring results, status of the grazing management program, and any concerns that arise.

Key collected monitoring data will be analyzed and presented in a table of summary statistics, including mean, range, and standard error (to approximate the 95% confidence intervals); raw data will also be made available to the resource agencies. Cumulative inter-annual summaries will be included in these tables for each of the variables. Heterogeneity in mass, height, and cover structure of the herbaceous foliage will be extrapolated as categories from these results. Minimization of the impacts of livestock herbivory and trampling on riparian zones will be judged from the observations. The status of special-status plant and animal habitat will be assessed from the observations. The degree of introduction and expansion of pest plant infestations will be assessed

from the field maps of these plants, and summarized with area and percent inter-annual change. Improvement and maintenance of high quality vegetation conditions, habitat of special natural communities, and ecosystem functions will be judged from observations and the results for all variables. The quality of forage and other conditions of rangeland ecosystem health will also be judged from the results for all variables. The need for additional infrastructure or their repair will be judged from the infrastructure and livestock use observations. The need and means to further protect special areas or repair problems will be judged by the conservation land manager and/or MID in consultation with the Livestock Operator. Judgments for the observational variables will be presented in individual tables as defined in the methods columns in Table 10 and Table 11 above. A digital or hardcopy album of photos from the photo documentation stations will be maintained in a manner allowing easy comparison between years by the conservation land manager, MID, or the resource agencies and sample photos will be used to illustrate key results in each annual report.

14.3 Timeframe of Grazing Related Monitoring

Monitoring need not require excessive time by any of the parties involved. Collection by the conservation land manager or conservation easement holder of monitoring data for all variables should take no more than several days per year for the mitigation area , plus time for analyses. Collection of monitoring data by the Livestock Operator for all variables in the mitigation area should take no more than one half day per month during the grazing period. Monitoring of any newly discovered special resources or problem areas that are directly affected by grazing will require extra time and provide important information to help determine whether additional protection or adaptation of the grazing management prescription is needed. The conservation easement holder will visit Madera Ranch with the Livestock Operator at least twice during the grazing period (half day), once at the beginning and once at the end of the grazing period, to discuss any management issues and exchange information. At that time the conservation easement holder may conduct the monitoring and take photographs at the permanent stations.

Monitoring and adaptation are essential parts of state-of-the-art professional rangeland management and “Best Management Practices.” Without monitoring information and planning adaptations, the managers would risk failures in meeting the short and long-term management objectives, avoiding the chance to correct inappropriate practices, and making changes to practices in accordance with shifts in knowledge of special resources or climate. Therefore, the monitoring and adaptation described here will continue over time, and be considered by MID and the conservation easement holder to be regular practices and costs of management of Madera Ranch. An initial instruction for the Livestock Operator by the conservation easement holder and MID will be required to assure that monitoring is conducted as planned. A regular schedule of monitoring and grazing planning will follow from year to year.

14.4 Modification of Management Related to Grazing

Modification of grazing management, including the objectives and performance standards, stocking schedule, and other actions will be made following an annual evaluation of the monitoring results by the Livestock Operator, MID, and others designated by MID at an annual meeting. Any modification will be based on those evaluations and the determination of significant potential for improved results due to modified management practices or new information. The conservation land manager or conservation easement holder will then make recommendations to the Livestock Operator on decisions needed about any adaptations of plans.

Adaptations may be triggered by performance of the grazing operations at each GMU according to the objectives and performance standards described earlier. Decisions will be based on whether the performance standards have been exceeded as described in Table 12.

Table 12. Summary of Grazing Management Decisions

Monitored Variable	Affected Management Practice	Determinations
Biomass—RDM	• Stocking rate and distribution	• If near or below standards at start of grazing period, then conservation land manger requests stocking reduction for current year and plans reduction for following year; • If significantly above or below standards at end of grazing period, then conservation land manager plans adjustments for following year; • If landscape patterns of biomass and utilization are uneven and significant patches are above or below standards at any time of year, then conservation land manager plans adjustments of livestock distribution using mineral licks, watering, or fencing
Height	• Stocking rate and distribution	• If near or below standards at start of grazing period, then conservation land manger requests stocking reduction by Livestock Operator for current year and plans reduction for following year; • If significantly above or below standards during grazing period, then Livestock Operator considers stocking adjustments and better distribution incentives for current year; • If significantly above or below standards at end of grazing period, then conservation land manager plans stocking adjustments and better distribution incentives for following year; • If landscape patterns are uneven and significant patches are above or below standards at any time of year, then conservation land manager plans adjustments of livestock distribution using mineral licks, watering, or fencing
Absolute Cover	• Stocking rate and distribution	• If near or below standards at start of grazing period, then conservation land manager requests stocking reduction by Livestock Operator for current year and plans reduction for following year; • If significantly below standards during grazing period, then Livestock Operator considers stocking adjustments and better distribution incentives for current year; • If significantly below standards at end of grazing period, then conservation land manager plans stocking adjustments and better distribution incentives for following year; • If landscape patterns are uneven and significant patches are below standards at any time of year, then conservation land manager plans adjustments of livestock distribution using mineral licks, watering, or fencing

Monitored Variable	Affected Management Practice	Determinations
Special-Status Natural Communities, Plants, and Animals	• Infrastructure Maintenance • Additional infrastructure • Grazing period	• If the monitoring determines that excessive livestock traffic and herbivory has exceeded the threshold for special-status plants, then plans will be made to adjust the grazing schedule and means of avoiding livestock pressure there
Grazing Exclosures	• Distribution	• If monitoring determines that livestock are allowed to access 400-foot buffers during the time when exclusion is prescribed, Livestock Operator will be asked to exclude livestock during prescribed times
Soil Erosion	• Special Grazing Treatment • Other Erosion Control Treatments	• If an existing significant erosion site expands in area by more than 10%, or if a new erosion site is discovered, then conservation land manager plans a special grazing treatment or other control for that site
Pest Plants	• Special Grazing Treatment • Other Pest Control Treatments	• If an existing significant infestation of any one of the pest plants rated high priority expands in area by more than 10%, or if a new infestation is discovered, then conservation land manager plans a special grazing treatment or other control for the site
Unplanned Disturbance	• Documentation • Repair or Response Treatments • Stocking Timing	• If an unplanned significant disturbance occurs, then conservation land manager, MID and Livestock Operator plan and perform a repair or response for the affected area, and plan a stocking timing adjustment
Actual Livestock Use	• Documentation • Stocking rate and distribution	• If the actual number of livestock grazing are not as prescribed, then Livestock Operator adjusts stocking
Infrastructure	• Maintenance	• If any facility is at serious risk of failure or is not functional, then the Livestock Operator will plan and implement repairs in consultation with the conservation land manager and MID
Illustrative Views	• Documentation	• The photos may prove valuable to aid memory or clarification
Operational Feasibility and Cooperation	• Communication • Maintenance	• If cooperation is not adequate or effective between the conservation land manager, MID and Livestock Operator, then parties will meet (with a facilitator if necessary) to resolve conflicts and plan for improved cooperation

14.5 Reporting Related to Grazing Monitoring

The Livestock Operator will report results of the monitoring data verbally upon request from MID or conservation land manager at any time, and in an annual letter to MID and conservation land manager within 2 weeks of receiving the Fall Monitoring Report or by December 1 whichever is earlier. The Livestock Operator will also verbally report any unusual conditions or unplanned disturbance observed at Madera Ranch to MID and conservation land manager as soon as possible. Conservation easement holder or conservation land manger will prepare a formal written annual report with monitoring results and recommendations for adaptations of the management plan.

14.6 Other Monitoring

Other research and monitoring efforts related to endangered species may be conducted on the mitigation lands under the oversight of USFWS, DFG, or MID.

15 Changed Conditions

15.1 Fire

Fires have occurred intermittently on Madera Ranch due to lightning or human causes. Often fire is able to be controlled after burning a small area, but in some years several hundred acres have burned. Unintentional fires will be extinguished as quickly as possible. MID will adhere to state fire standards for rural properties. If mitigation lands burn, MID and conservation land manager will let the area naturally regenerate. If it is determined by a Certified Rangeland Manager or conservation land manager, in consultation with the resource agencies, that additional supplemental seeding is needed, conservation land manager will facilitate the reseeding of the area burned. The intent of reseeding is to minimize erosion, avoid the introduction of new plant species, and enhance natives, if possible. The conservation land manager will propose an appropriate seed mix or possibly collect seed on-site to facilitate reseeding. Fire may also be used as a management tool as described in Section 7.1.8 Grazing Management Related to Fire Hazard Reduction, and shall only be used with approval of DFG, USFWS, CALFIRE, and CARB.

15.2 Flood/Erosion

Swales have historically flooded and during very large rain events rainwater may collect throughout the property. Large scale flooding, including scour and deposition of sediment, within the mitigation area is not expected because it is not adjacent to a river or creek. However, mitigation Area 3 includes swales that will be used for banking and the swales may be used during these events. The amount of water that can be applied is still limited by the canal size and is therefore not expected to flood substantial portions of this mitigation area.

15.3 Drought

Drought is likely to continue to affect Madera Ranch. The primary tool to maintain habitat suitability during droughts is to minimize grazing as prescribed earlier in this document.

16 Funding

16.1 Summary of Costs

Costs for implementation of the habitat and species surveys associated with the mitigation lands are provided in Table 13. Establishment costs are $320,598 and endowment costs are $1,305,555. Vernal pool restoration and non-mitigation area monitoring will be paid from MID's capital budget for the project. Average annual costs include grazing surveys, wildlife surveys, botanical surveys, management actions, reporting time, administration, management, direct expenses, and contingency, and are expected to be approximately $45,694 per year. With a capitalization rate of 3.5%, which factors in inflation and expected returns, an endowment of $1,305,555 will be required to generate income to support future costs. Average annual costs, including establishment and expenses, can also be calculated on a per acre basis and are estimated at $279.84. Because Mitigation Areas 1 and 2 encompass approximately 2,356 acres, $659,304 will be provided up front. The remainder of the funding, $966,849 will be provided when the second conservation easement is recorded.

Table 13. MID Mitigation Land Endowment Cost Forecast

Management Plan Action	Hourly Rates										Fixed Costs		Total	Occurrence Cycle	Secured Stewardship Account	
	Land Mgr. ($125)		Sr. Tech ($90)		Tech ($75)		Field Crew ($35)		Ad staff ($50)							
	Hr	Cost	Hr	Cost	Hr	Cost	Hr	Cost	Hr	Cost	Cost	Qty			Establish-ment	Endowment
Boundary Survey		-		-		-		-		-	$45	0.0	*$-*	upfront	*$-*	*$-*
Signage (no trespass every 0.25 mile)		-		-		-		-		-	$10	36.0	*$360*	5	*$-*	*$1,918*
Signage		-		-		-		-	-	-	$10	36.0	*$360*	upfront	*$360*	*$-*
Fencing (5 strand for 20 miles of fencing)		-		-		-		-		-	$4.75	1.1E+05	*$501,600*	30	*$-*	*$277,619*
Gate - powder river		-		-		-		-		-	$200	4.0	*$800*	10	*$-*	*$1,948*
Fencing repair (2 miles includes cost of materials)		-		-		-	24	840		-	$1	10560.0	*$11,400*	1	*$-*	*$325,714*
Pizometer Readings (measuring depth to first encountered gw)		-		-		-	4	140		-			*$140*	1	*$-*	*$4,000*
Grazing Mgmt - monitor RDM conditions		-		-		-	32	1,120		-			*$1,120*	1	*$-*	*$32,000*
Surveys for CTS	16	2,000		-	16	1,200		-		-			*$3,200*	10	*$-*	*$7,793*
Surveys for invertebrates		-	40	3,600	40	3,000		-		-			*$6,600*	10	*$-*	*$16,074*
Botanical Surveys	-	-		-		-		-		-			*$-*	10	*$-*	*$-*
Small Mammal Surveys	40	5,000		-	40	3,000		-		-			*$8,000*	10	*$-*	*$19,484*

Management Plan Action	Hourly Rates: Land Mgr. ($125) Hr	Land Mgr. ($125) Cost	Sr. Tech ($90) Hr	Sr. Tech ($90) Cost	Tech ($75) Hr	Tech ($75) Cost	Field Crew ($35) Hr	Field Crew ($35) Cost	Ad staff ($50) Hr	Ad staff ($50) Cost	Fixed Costs Cost	Fixed Costs Qty	Total	Occurrence Cycle	Secured Stewardship Account: Establish-ment	Secured Stewardship Account: Endowment
BNLL Surveys	40	5,000	40	3,600	40	3,000		-		-			*$11,600*	10	*$-*	*$28,251*
General Bird / WL Surveys		-		-	24	1,800		-		-			*$1,800*	10	*$-*	*$4,384*
Surveys CTS (annually x 3 years) - average or above water years		-		-		-		-		-	$3,200	3.0	*$9,600*	upfront	*$9,600*	*$-*
Surveys for invertebrates (annually x3)		-	40	3,600	40	3,000		-		-	$6,600	3.0	*$26,400*	upfront	*$26,400*	*$-*
Surveys for small mammals (annually x1)		-		-		-		-		-	$8,000	0.0	*$-*		*$-*	*$-*
Surveys for SJKF	8	1,000		-	8	600		-		-			*$1,600*	10		*$3,897*
Surveys for SJKF (annually x3)		-		-		-		-		-	$3,200	3.0	*$9,600*	upfront	*$9,600*	*$-*
Field Equipment (binoculars, camera, GPS unit, waders, seins, nets, etc.) - Rental / purchase		-		-		-		-		-	$2,800	1.0	*$2,800*	upfront	*$2,800*	*$-*
Field Equipment (binoculars, camera, GPS unit, waders, seins, nets, etc.) - replacement over time		-		-		-		-		-	$2,800	1.0	*$2,800*	10	*$-*	*$6,819*

Management Plan Action	Hourly Rates										Fixed Costs		Total	Occurrence Cycle	Secured Stewardship Account	
	Land Mgr. ($125)		Sr. Tech ($90)		Tech ($75)		Field Crew ($35)		Ad staff ($50)							
	Hr	Cost	Hr	Cost	Hr	Cost	Hr	Cost	Hr	Cost	Cost	Qty			Establish-ment	Endowment
Easement Monitoring		-	16	1,440	16	1,200		-		-			*$2,640*	1	*$-*	*$75,429*
Invasive Control - weed mgmt. (includes cost of materials and sprayers)		-		-	16	1,200	16	560		-	$750	1.0	*$2,510*	7	*$-*	*$9,218*
Invasive Control - animals (includes cost of traps and other equipment)		-		-		-	16	560	-	-	$400	1.0	*$960*	5	*$-*	*$5,115*
Controlled Burning - hand crew - cost per day		-		-		-		-		-	$726	1.0	*$726*	25	*$-*	*$533*
Controlled Burning - water tender		-		-		-		-		-	$100	1.0	*$100*	25	*$-*	*$73*
Controlled Burning - bulldozer		-		-		-		-		-	$100	1.0	*$100*	25	*$-*	*$73*
Controlled Burning - engine		-		-		-		-		-	$130	1.0	*$130*	25	*$-*	*$95*
MID employee training (sensitive WL avoidance, impact minimization measures).		-	4	360		-		-		-			*$360*	10	*$-*	*$877*
Mileage (travel to site)		-		-		-		-		-	$1	1000.0	*$550*	1	*$-*	*$15,714*
Fuel - equipment		-		-		-		-		-	$3	20.0	*$60*	1	*$-*	*$1,714*

Management Plan Action	Hourly Rates: Land Mgr. ($125) Hr	Land Mgr. ($125) Cost	Sr. Tech ($90) Hr	Sr. Tech ($90) Cost	Tech ($75) Hr	Tech ($75) Cost	Field Crew ($35) Hr	Field Crew ($35) Cost	Ad staff ($50) Hr	Ad staff ($50) Cost	Fixed Costs Cost	Fixed Costs Qty	Total	Occurrence Cycle	Secured Stewardship Account: Establish-ment	Secured Stewardship Account: Endowment
Trash Clean-up		-		-		-	8	280		-			*$280*	5	*$-*	*$1,492*
Dumping fees		-		-		-		-		-	$65	1.0	*$65*	5	*$-*	*$346*
Data Management		-		-		-		-	40	2,000			*$2,000*	1	*$-*	*$57,143*
Annual Report and Workplan preparation		-	40	3,600		-		-	40	2,000			*$5,600*	1	*$-*	*$160,000*
Administrative Operations (invoicing, oversight, managing contracts, etc.)		-	20	1,800		-		-	40	2,000			*$3,800*	1	*$-*	*$108,571*
DFG staff report review time		-	8	720		-		-		-			*$720*	1	*$-*	*$20,571*
														Stewardship subtotal	$48,760	$1,186,868
													10.0%	Contingency	$4,876	$118,687
													22.0%	Administrative	$271,838	
													3.5%	Interest Rate		
														Endowment Subtotals	$320,598	$1,305,555
														Grand Total		$1,626,153

16.2 Adequacy of Funds

MID will fund the initial and capital costs, the endowment, and the first 5 years of monitoring costs associated with Mitigation Areas 1 and 2 for a total of $1,131,093. MID will fund the endowment and the first 5 years of monitoring costs associated with Mitigation Area 3 for a total of $702,306 when the conservation easement is recorded on these lands. MID will pay for additional water-banking related capital expenses as they arise and water banking monitoring expenses out of its operational budget. As a public entity, MID will secure a letter of credit if necessary to ensure additional expenses will be paid. Additional grants and other funding sources may be obtained in the future to conserve more of the property or conduct additional surveys or restoration activities.

17 Reporting and Oversight

MID will produce an annual report for USFWS, DFG, the Corps, and Reclamation for the first 5 years of implementation and every 5 years thereafter for the duration of the project. Additional reporting is described in *Vernal Pool Restoration and Management* section of this document. MID and the conservation land manager will work with the Livestock Operator to obtain their annual report. MID and the conservation land manager will also keep a log of other management issues that arise throughout the year.

USFWS, DFG, the Corps, and Reclamation will be provided access the property and access to data records within a reasonable amount of time following such a request. Site access can typically be provided within several days and the timing on data records will depend on the complexity and amount of data requested.

18 Data Collection and Processing

18.1 Annual Report

MID will produce an annual report for USFWS, DFG, the Corps, and Reclamation for the duration of the project. The report will generally include the following information:

- Executive summary
- Introduction
- Habitat condition summary
    - Annual grasslands
    - Alkali grasslands
    - Vernal pools
    - Swales
    - Invasives
- Grazing summary and detail

  - Data collection results
  - Implications for management
- Wildlife species summary and detail
  - Methods
  - Findings
- Botanical species summary and detail
  - Methods
  - Findings
- Management issues and considerations
  - Grazing
  - Wildlife
  - Vegetation
- Costs and funding
- Conclusions

19 Oversight and Consultation

The landowner of Madera Ranch (currently MID) will be responsible for and oversee the implementation of this Mitigation and Management Plan. The conservation easement holder will periodically monitor the site to determine if the terms of the conservation easement are being fulfilled and the conservation land manager will conduct detailed monitoring of the Mitigation Areas. USFWS, DFG, the Corps and the conservation easement holder will receive copies of the annual report each year one is prepared. MID and conservation land manager will meet with USFWS, DFG, and the Corps as requested to discuss the management of Madera Ranch.

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