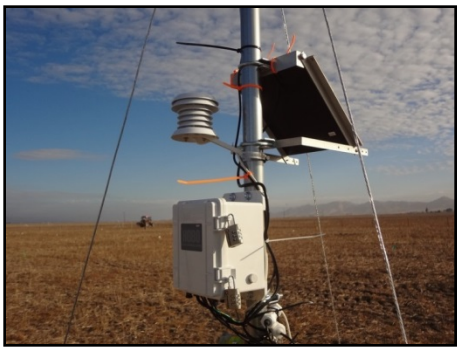

H.T. HARVEY & ASSOCIATES

Ecological Consultants

California Valley Solar Ranch
San Luis Obispo County, CA

Offsite Mitigation Properties
Pilot Shrub Planting Study
Biological As-built Report

Project #3103-06

Prepared for:
SunPower Corporation
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Richmond, CA 94804

Prepared by:

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25 April 2014

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Section 1.0 Introduction

1.1 Project Overview

On 19 April 2011, the Board of Supervisors of San Luis Obispo County approved the California Valley Solar Ranch (CVSR) Project Conditional Use Permit (CUP; DRC 2008-00097) through adoption of Resolution #2011-119. The CUP is subject to the Conditions of Approval (COA) set forth in Exhibit 6 attached to the Resolution.

The Project established a 250-megawatt solar power plant, now in operation, on an approximately 4690-acre (ac) property in eastern San Luis Obispo County, California (Figure 1). The solar facility includes nine solar photovoltaic arrays that encompass approximately 1400 ac, as well as onsite access roads, a substation, an operations and maintenance building, a reverse osmosis water system and water tank, a water treatment pond, and underground and overhead electrical and transmission lines.

Compensation for habitat impacts caused by the construction of the Project included the acquisition of 9157 ac of diverse mitigation lands (H. T. Harvey & Associates [HTH] 2011). All of the mitigation lands will be preserved and enhanced through changes in land management practices, as described in the *CVSR Habitat Mitigation and Monitoring Plan* (HMMP; HTH 2011). In addition, a portion of the mitigation lands acreage will be restored to California annual grassland and shrubland target habitats, per the requirements in COA #60 of the CUP and Measure 8 of Project's Incidental Take Permit (ITP; No. 2081-2011-044-04). For this effort, HTH prepared an *Off-site Mitigation Properties Revegetation Plan* that describes the specific revegetation guidelines and success criteria to be applied to California annual grassland and shrubland restoration on Project mitigation lands (HTH 2012).

In summer 2012, the California Department of Fish and Wildlife (CDFW) and U.S. Fish and Wildlife Service (USFWS) requested a consultation on the Project, to review the most appropriate approach to restoring habitat on the mitigation lands. On 25 October 2012, representatives from HTH, SunPower Corporation (SunPower), CDFW, and USFWS met to discuss the revegetation activities proposed for the offsite mitigation properties and toured several of these properties together to discuss appropriate revegetation strategies and long-term goals. Representatives of CDFW clarified that the Project's ITP requires shrubland restoration to be targeted on 50% of the offsite mitigation acreage of the properties determined to be potentially suitable for supporting shrubland plant communities. Further discussions concluded that the following properties would be included in the suite of lands to be monitored for California annual grassland habitat, and that these properties may also be appropriate for supporting shrubland habitat. Several of these properties are referenced by the last name of their previous landowners for convenience only.

1. The 946-ac Diefenderfer property
2. The 652-ac Ruskovich property

3. The 160-ac Freeborn property
4. The 327-ac Turner property
5. A subset of the California Valley mitigation parcels, totaling 200 ac (Community Services District [CSD] Lots #2, 3, 4, and 6)
6. The 620-ac Northern Tab property (because of the existing habitat on this property, it will not be considered for shrubland restoration, but will be monitored for vegetation cover and composition)
7. The 119-ac Southern Tab property (because of the existing habitat on this property, it will not be considered for shrubland restoration, but will be monitored for vegetation cover and composition)

It was also agreed that the remainder of the California Valley mitigation parcels and all of the South Carrizo mitigation parcels would not be included in the suite of lands that may be actively revegetated.

Another outcome of the consultation was the decision to postpone shrub revegetation while HTH developed and implemented a pilot shrub planting study (Pilot Study). The Pilot Study would investigate the main variables associated with successful restoration of shrubland habitat. The design plan for the Pilot Study was described in the *Off-site Mitigation Properties Pilot Shrub Planting Study Report* (Pilot Study Report) (HTH 2013), which was submitted to CDFW and USFWS in 2013. The previously prepared *Off-site Mitigation Properties Revegetation Plan* had identified techniques for large-scale shrubland revegetation and provided a plant species palette for the Diefenderfer, Ruskovich, and Turner properties (HTH 2012); however, regulatory agency representatives expressed concern about the level of disturbance (e.g., tillage and herbicide use) associated with the revegetation approach. The agencies, SunPower, and HTH agreed that, instead of conducting shrubland revegetation according to the revegetation plan, the results of the Pilot Study would be used to determine the most appropriate site preparation techniques, target shrub species (if shrubland habitat is determined to be appropriate), and long-term success criteria.

Based on the conditions of all the properties considered for shrubland restoration, it was determined that the Pilot Study would be implemented on the Diefenderfer, Ruskovich, and Freeborn properties. The Turner property was not included in the Pilot Study because it is highly infested with Russian thistle (*Salsola tragus*). Rather than cause additional disturbance by attempting revegetation activities, the Turner property will be managed for habitat enhancement per the HMMP. CSD Lots #2, 3, 4, and 6 will also be managed per the HMMP. (But based on the results of the Pilot Study, the Turner property and the CSD Lots may be included in future shrubland revegetation activities.)

The Pilot Study was implemented between 26 September and 4 December 2013. This Pilot Shrub Planting Study Biological As-built Report has been prepared to document study implementation, which included selecting representative research study areas on each of the three selected mitigation properties; installing livestock and pronghorn (*Antilocapra americana*) exclusion fencing on the perimeter of each study area; staking and flagging individual study blocks and plots; installing a centrally located and remotely monitored weather station; performing soil seedbed preparation prescriptions as designated in the experimental design; seeding; and applying rodent and other small mammal herbivory deterrent. HTH restoration ecologists, botanists, and

landscape architects performed, monitored, and inspected all implementation tasks. Implementation was conducted in accordance with the Pilot Study Report (HTH 2013), with minor adjustments, as described herein.

1.2 Study Location

The Ruskovich, Freeborn, and Diefenderfer properties are located in an unincorporated area of eastern San Luis Obispo County, California, adjacent to State Route (SR) 58 between U.S. Route 101 and U.S. Interstate 5 (Figure 1). This area is on the Carrizo Plain, a closed drainage subbasin bordered by the Temblor Range to the northeast and the Caliente Range to the southwest (Hoover 1970). The San Andreas Rift Zone extends along the northeast boundary of the Carrizo Plain, close to the mitigation properties. Surface water in the region drains to the south and forms Soda Lake, which is located southeast of all three properties.

1.3 Pilot Study Design

The Pilot Study was designed to achieve four goals. Each goal, as well as how it was addressed in the Pilot Study design, is discussed below.

Goal 1—Evaluate if restoration of native shrubland habitat is appropriate for each property. The target habitat will resemble the valley saltbush scrub community described by Holland (1986) as occurring around the Carrizo Plains on rolling alluvial fans with low relief.

To examine the feasibility of shrubland habitat restoration, study areas were installed on all three properties: three each on the Ruskovich and Diefenderfer properties, and four on the Freeborn property. Study areas were further divided into blocks and plots. Different combinations of seedbed preparation and seeding methods were applied at the block and plot level. A native shrub seed mix was sown in all of the seeded plots. The vegetation in the study plots will be monitored for 5 years, and resulting data will be used to determine the suitability of the properties in question for shrubland restoration. In the event that shrubland restoration is deemed appropriate, comparisons of seedbed preparation and seeding methods will facilitate seeding efforts.

Goal 2—Determine the effects of site-specific characteristics (e.g., soils, topography, prior land use, disturbance history, and other property-specific environmental factors) on successfully establishing shrubland habitat.

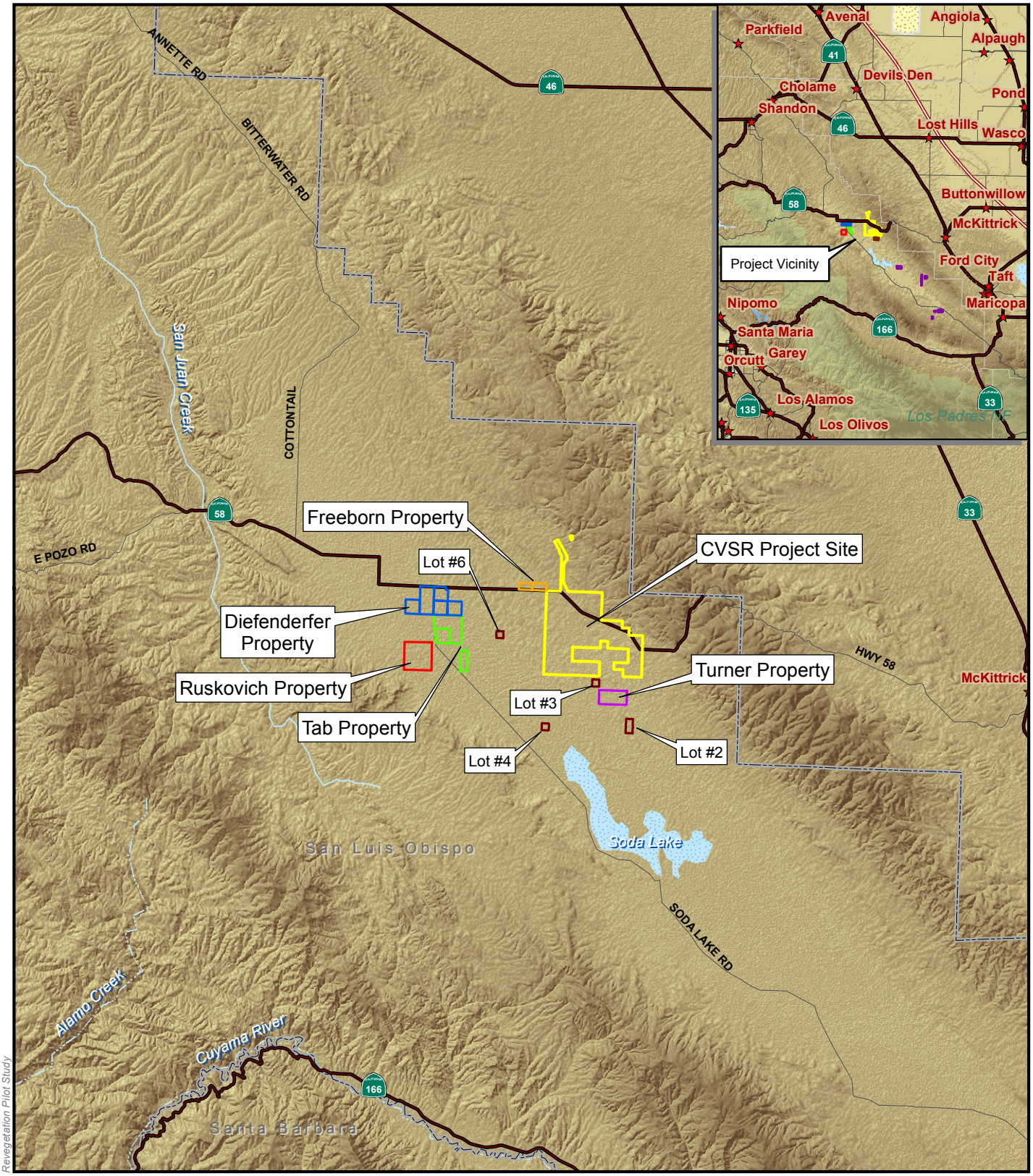
The locations of the study areas were selected to capture the variation in each property's characteristics. The monitoring data will be used to examine relationships between site characteristics and shrub establishment. The resultant understanding of site-specific characteristics will be used to guide restoration design.

Goal 3—Determine the most effective means of soil seedbed preparation, seeding techniques, and weed suppression (as applicable) for establishing native shrubland habitat.

Several industry-standard seedbed preparation and seeding methods were implemented to determine which are most effective. The seedbed preparation methods were knifing, double knifing, disking, and no tillage (as the control). The seeding methods were drill seeding, broadcast seeding, and no seeding (control). The study was also designed to test weed suppression of field bindweed (*Convolvulus arvensis*) on the Diefenderfer property; however, this treatment was not implemented in fall 2013 because drought conditions had severely limited field bindweed growth. However, this treatment may be implemented in future years.

Goal 4—Determine appropriate long-term vegetation establishment success criteria for these and other offsite mitigation lands.

The data obtained through the 5-year monitoring period will be used to characterize shrub establishment using the methods tested in the Pilot Study, and to develop appropriate success criteria for large-scale restoration.



CVSR Project Site
CSD Lots
Diefenderfer Property
Freeborn Property
Ruskovich Property
Tab Property
Turner Property

Scale

1:316,800

1 inch = 5-miles

0 5 Miles

Coordinate System: North American Datum 83 Universal Trans Mecator (UTM) Zone 11 North

Data Sources: [1] CA GIS Library, [2] ESRI BaseMap USA (2010).

California Valley Solar Ranch

Offsite Mitigation Properties Pilot Shrub Planting Study Biological As-Built Report

Figure 1: Vicinity Map

HPR II

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N:\Projects3000\3103-01\Reports\CVSR Revegetation Pilot Study

Section 2.0 Implementation

2.1 Timeline

Pilot Study implementation was conducted in two phases: study area establishment and treatment implementation. The following timeline provides the dates during which the tasks associated with these two phases were performed:

- Study area establishment
  - Study area layout and fencing: 26 September–6 November 2013
  - Plot and block staking and flagging: 26–31 October 2013
  - Weather station installation: 30–31 October 2013
- Treatment implementation
  - Soil seedbed preparation: 11–21 November 2013
  - Seeding and Plantskydd® application: 21 November–2 December 2013
  - Restaking and reflagging for ongoing monitoring: 3–4 December 2013

2.2 Study Area Establishment

2.2.1 Layout and Fencing

The Pilot Study includes eleven study areas distributed across three offsite mitigation properties (further details provided in Section 3.) HTH restoration ecologists used a Global Positioning System (GPS) device to locate each corner of the study areas, which were then marked with wooden lathe. Following layout, C&W Construction Specialties constructed exclusion fencing around each study area. All work was inspected by HTH staff and SunPower representatives to ensure compliance with the contract documents. Four-strand barbed-wire fences with 12-foot (-ft) -wide access gates were installed to prevent livestock and pronghorn from grazing on the study areas while allowing equipment access. White rag flagging was installed on the top wire strand at the midpoint between each line post to alert pronghorn to the fences.

2.2.2 Plot and Block Design, Staking, and Flagging

Before installing the field staking and flagging, HTH ecologists determined the layout for each study area using a split-plot experimental design. Each study area was divided into treatment blocks, which were further divided into plots. Treatments were randomly assigned to individual blocks and plots and marked in the field. Within each study area, the corners of each 50-ft by 44-ft treatment block were marked with 18-inch (in) wooden survey stakes. Stakes were painted with colors corresponding to the treatment randomly assigned to each block (Table 1). Individual study plots measured 5 ft wide rather than the originally planned 8 ft. This change was made because 5 ft is the actual seeded width achievable using available seeding equipment.

Colored flags were used to mark the approximate center of each 5-ft by 50-ft rectangular plot, with a different-color flag used for each plot-level treatment within a given study area (Table 1).

Table 1. Stake and Flag Colors at Block and Plot Level

Property	Division	Treatment	Stake/Flag Color
Ruskovich	Block	Knife tillage	Blue stakes
		Double-knife tillage	Red stakes
		Disk tillage	Green stakes
		No tillage (control)	White stakes
	Plot	Drill seeding	Green flags
		Broadcast seeding	Yellow flags
		No seeding (control)	White flags
Freeborn	Block	No treatment at block level	Red stakes
		No treatment at block level	Green stakes
	Plot	No tillage and drill seeding	Green flags
		Disk tillage and broadcast seeding	Yellow flags
		No seeding (control)	White flags
Diefenderfer	Block	Future potential field bindweed control	Green stakes
		No field bindweed control	Red stakes
	Plot	No tillage and drill seeding	Green flags
		Disk tillage and broadcast seeding	Yellow flags
		No tillage and broadcast seeding	White flags
		No seeding (control)	Blue flags

2.2.3 Weather Station Installation

On 31 October 2013, a HOBO® weather station was installed in the northwest corner of Diefenderfer Study Area 3 (Figure 2). The HOBO weather station logs data, at 5-minute intervals, on air temperature (°C), soil temperature (at a depth of approximately 6 in) (°C), volumetric soil water content (at a depth of approximately 6 in) (cubic meter (m^3)/m^3), relative humidity (%), dew point (°C), and precipitation (millimeters [mm]). The station's data logger records and uploads averaged data online every 4 hours. Additionally, a manually read rain gauge was installed on the northeast corner of Freeborn Study Area 4 on 30 October 2013. This rain gauge is manually checked and emptied regularly following precipitation events, and the data is recorded in a precipitation log.

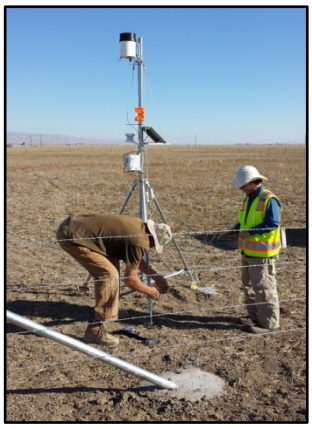


Figure 2. Setting up the HOBO Weather Station

2.3 Treatment Implementation

2.3.1 Equipment

The following equipment was used to implement the Pilot Study treatments:

- Tractor (four-wheel drive, 120 horsepower) with rear hydraulic servers and three-point hitch with 2500-pound lift capacity
- Knife chisel cultivator (5 ft wide) with six evenly spaced injector knife blades
- Offset tandem disk (6 ft wide)
- Nonfloating ring-roller cultipacker (5 ft wide)
- Kincaid cone research plot drill (Kincaid cone drill)
    - 5-ft seeding width; 16-in row spacing
    - features include leading fluted coulters, double-disk furrow openers, and 2-in-wide rubber press wheels
- Truax Trillion® broadcast seed drill (Truax broadcast seeder)
    - 5-ft seeding width
    - features include leading and rear nonfloating, ring-roller cultipackers; center "fluffy" seed box with auger/agitator and picker wheels; and rear large-seed/cool-season grain box

2.3.2 Soil Seedbed Preparation

HTH restoration ecologists implemented three types of soil seedbed preparation treatments: knife tillage, double-knife tillage, and disk tillage. All tillage implements were attached with a three-point hitch to the tractor to permit maximum maneuverability, accuracy of placement within plots, and control of soil penetration depth. The tractor was run at approximately 2.5–3.5 miles per hour (mph) during tillage, depending on the implement. A description of each type of treatment is provided below. More detailed information on where each seedbed preparation treatment was implemented is included in Section 2.9, "Property-specific Designs."

Figure 3. Modified Chisel Cultivator

Knife Tillage

The knife tillage treatment was performed using a 5-ft-wide chisel cultivator modified to use six evenly spaced injector knife blades rather than standard chisel points (Figure 3). Approximately 400 pounds of ballast weight were added to the top of the chisel to facilitate soil penetration and tillage to the desired depth of approximately 6 in. Because of significant soil compaction, a single pass with the chisel cultivator resulted in tillage to a depth of 4–6 in. Following tillage, a pass was made with a nonfloating, ring-roller cultipacker (approximately 200-pound weight; Figure 4). This pass firmed the soil and minimized clod remnants in the tilled plot. The cultipacker was a drawbar type, operated at approximately 3.5 mph.

Double-knife Tillage

The double-knife tillage treatment, designed for severely compacted soils, consisted of two opposite-direction passes with the chisel, modified with injector knife blades. The second pass resulted in the blades reaching a depth of 6–8 in. A cultipacker treatment (as described above for knife tillage) was applied after both passes with the chisel cultivator.

Disk Tillage

The disk tillage treatment consisted of passes with a chisel cultivator (single or double), offset tandem disk, and a cultipacker. To loosen the soil and allow for the penetration of disk blades, plots assigned to disk tillage were first tilled with a chisel cultivator, as described above. These knifing preparations resulted in a tilled depth of 6–8 in on all plots. Next, a 6-ft-wide offset tandem disk pulling a nonfloating, ring-roller cultipacker was used to till the plots (Figure 4). The same 400-pound ballast weight used on the chisel cultivator was transferred to the top of the tandem disk, resulting in a disking depth of approximately 5–8 in.

Figure 4. Offset Tandem Disk and Ring-roller Cultipacker

2.3.3 Seeding Methods

Seeding was performed after the soil seedbeds were prepared. Seeding was completed using either a Kincaid cone drill (Figure 5) or a Truax broadcast seeder (Figure 6). These seeders are common and preferred implements for seeding wildland areas with unprepared or minimally disturbed seedbeds and highly disturbed seedbeds, respectively. Both seeders were calibrated outside the study areas before seeding, to achieve target seed application rates (e.g., see Figure 6B).

Drill Seeding

A Kincaid cone drill was used to perform drilled row seeding (Figure 5). During seeding, two ecologists sat on the drill and filled each cone with the appropriate amount of seed for each plot. The leading fluted coulter disk blades (attached to the front toolbar of the drill frame) cut through surface plant residue, providing an open path for each double-disk opener, depositing seed in four rows. Four cone-metering and calibration mechanisms, one per seed row, accurately measured and disseminated small seed quantities (typically measured in grams per row) over the full 50-ft standard length of each seeded plot.

Figure 5. Kincaid Cone Drill, Used for Drill Seeding

A 2-in-wide rubber press wheel located behind each disk-opener mechanism firmed the soil over the seed, which was planted at a depth of approximately 0.5 in. Seeding using the Kincaid cone drill was performed at a speed of approximately 2.5 mph.

Broadcast Seeding

Broadcast seeding was performed with a 5-ft-wide Truax broadcast seeder (Figure 6). The center "fluffy" seed box with auger/agitator and picker wheels was used to distribute a six-species mixture with wheat bran (described in the next section). Bladderpod (*Peritoma arborea*) seeds were deposited using the rear large-seed/cool-season grain box. Designed with both leading and rear ring-roller cultipackers, the Truax broadcast seeder smoothed and firmed the seedbed, evenly broadcasted the seed, and imprinted the seed approximately 1 in into the firmed soil surface in a single pass.

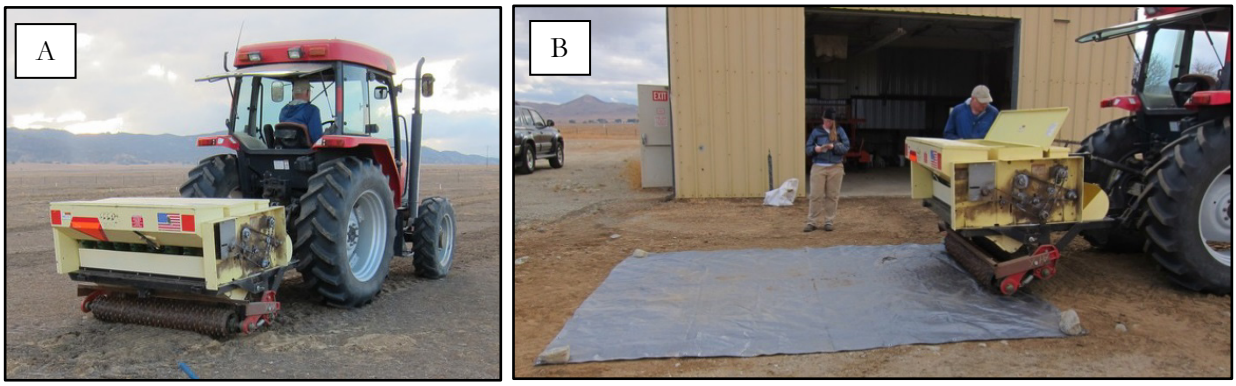


Figure 6. A: Truax Trillion® Broadcast Seeder in Use
B: Calibration of the Truax Broadcast Seeder

Species Palette

One species palette was used to seed all study areas to isolate the effects of different soil seedbed preparation and seeding methods on revegetation results. Seed was obtained from S&S Seeds, located in Carpinteria, California. The seed mixture was composed of allscale (*Atriplex polycarpa*), spinescale (*A. spinifera*), alkali

goldenbush (*Isocoma acradenia),* bush seepweed (*Sueada nigra*), bladderpod, buckwheat (*Eriogonum fasciculatum* var. *polifolium*), and matchweed (*Gutierrezia californica*) (Table 2). Seed application rates were modified to reflect the actual seeded plot area. The seed was mixed to better facilitate seed metering and flow through the seeders and to compensate for the disparity in seed size, shape, and purity between bladderpod (large, round, and smooth, with higher purity and germination rates) and the remainder of the species (small, irregular, and often hairy, and with generally very low purity and germination rates). Accordingly, all species except bladderpod were combined in a single mixture with wheat bran on 1:1.25 weight ratio to maintain the small, often fluffy seed in suspension and to uniformly distribute it within the mixture. The bladderpod seeds were separately sown.

All seed was collected from the Carrizo Plain, except for the bladderpod seed, which was collected from Bakersfield, as approved by CDFW for this study. Although interior goldenbush (*Ericameria linearifolia)* was originally recommended for inclusion in the plant palette, no viable seed was found in the Carrizo Plain this year, so this species was not included. All seed was tested for percent purity, percent germination, and weed seed content according to Association of Official Seed Certifying Agencies and California Crop Improvement Association standards. Seeding rates were chosen in consideration of multiple factors, including dry land conditions (no irrigation), an anticipated 33% loss of seed to consumption by animals, and cost.

2.3.4 Mammal Herbivory Deterrence

Plantskydd® animal repellant (Tree World Plant Care Products, Inc.; St. Joseph, Missouri) was applied to all seeded plots and around the perimeter of each study area to deter seed loss and herbivory of germinating vegetation by rodents and other small mammals. The active ingredient of Plantskydd® is dried porcine and bovine blood products bound with vegetable oil, which emits an odor that discourages herbivory. The granular Plantskydd® formula was manually broadcast at a width of approximately 6 ft. A Vigoro® handheld rotary broadcast spreader was used to apply the Plantskydd® at the recommended rate of 1 pound per 600 ft^2, or approximately 75 pounds per acre, for a total application of 200 pounds across the ten study areas. Plantskydd® was applied around the perimeter of each study area and on each seeded plot immediately after seeding was complete.

2.3.5 Stake and Flag Reinstallation

The use of heavy equipment during soil seedbed preparation and seeding treatments knocked over stakes and flags. To facilitate future monitoring, all damaged stakes and flags were reinstalled after all heavy equipment use was completed.

Table 2. Species Palette and Seeding Rates

Scientific Name[1]	Common Name[1]	Pure Live Seed (PLS)[2]	Species Mixture Composition	Kincaid Cone Drill Seeding Rate[3] PLS	Kincaid Cone Drill Seeding Rate[3] PLS	Kincaid Cone Drill Seeding Rate[3] BULK	Truax Broadcast Seeding Rate[4] PLS	Truax Broadcast Seeding Rate[4] PLS	Truax Broadcast Seeding Rate[4] BULK
		(%)	(%)	(Grams per Plot)	(Pounds per Acre)	(Pounds per Acre)	(Grams per Plot)	(Pounds per Acre)	(Pounds per Acre)
Atriplex polycarpa	allscale	24.5%	14.3%	0.9	0.3	1.2	1.8	0.6	2.5
Atriplex spinifera	spinescale	19.9%	14.3%	4.1	1.6	8.0	8.2	3.2	16.1
Isocoma acradenia	alkali goldenbush	8.7%	14.3%	0.5	0.2	2.3	1.0	0.4	4.6
*Suaeda nigra (*formerly *S. moquinii)*	bush seepweed	26.3%	14.3%	0.5	0.2	0.8	1.0	0.4	1.5
*Peritoma arborea (*formerly *Isomeris arborea)*	bladderpod	31.9%	14.3%	86.6	33.2	104.1	173.2	66.4	208.2
Eriogonum fasciculatum var. polifolium	buckwheat	3.4%	14.3%	1.2	0.5	14.6	2.4	1.0	29.2
Gutierrezia californica	matchweed	1.0%	14.2%	0.1	0.0	4.2	0.2	0.1	10.4
	Totals =		**100.0%**	**93.9**	**36.0**	**135.2**	**187.8**	**72.1**	**272.5**

[1] ***Common and scientific names are taken from the Jepson Manual, Second Edition (Baldwin et al 2012).***

[2] ***Pure live seed (PLS) percentage is obtained by multiplying the purity percentage by the percentage of total viable seed (i.e., germination rate). The recommended PLS application rate is divided by %PLS for each species to deternine total bulk pounds required to provide the PLS application rate shown in the table.***

[3] ***Based on 30 PLS seeds per linear foot of individual drill row (4 rows per 5-foot seeded plot width).***

[4] ***Based on 60 PLS seeds per square foot of drilled plot area (per 5-foot seeded plot width).***

Section 3.0 Property-specific Designs

3.1 Ruskovich Property

3.1.1 Study Variables and Implementation

Three study areas on the Ruskovich property were established to investigate three variables: 1) location within the property; 2) soil seedbed preparation method; and 3) seeding method. The study areas were selected based on evidence of past land use and soil characteristics (Figure 7):

Area 1: center of the property (Wasioja soils, history of moderate grazing)
Area 2: northeast corner of the property (Yeguas-Pinspring complex soils, history of heavy grazing)
Area 3: southeast portion of the property (Wasioja soils, history of heavy grazing)

Study areas were constructed to the dimensions outlined in the Pilot Study Report, with their locations slightly adjusted to minimize disturbance and accommodate site conditions (Figure 7).

3.1.2 Block and Plot Design

Each of the Ruskovich property study areas included 16 blocks (Figure 8). Four soil seedbed preparation treatments (knife, double knife, disk, and no tillage) were applied at each of four blocks (Figure 8). Disk tillage followed a double pass with a chisel cultivator. Three seeding plots were established within each block (Figure 8). One plot in each block was drill seeded, one was broadcast seeded, and one was not seeded. Colored flags were placed at either end of each plot to indicate which seeding method was applied (Table 1).

3.2 Freeborn Property

3.2.1 Study Variables and Implementation

Four study areas were established on the Freeborn property to evaluate the following variables: 1) location within the property; 2) location with respect to a burn area; and 3) seeding method. The study areas were selected based on recent burn history and soil characteristics (Figure 9):

Area 1: northwestern portion of the property (Seaback-Panoza-Jenks complex soils, burned)
Area 2: southwestern portion of the property (Seaback-Panoza-Jenks complex soils, unburned)
Area 3: northeastern portion of the property (Polonio-Thomhill complex soils, burned)
Area 4: southeastern portion of the property (Polonio-Thomhill complex soils, unburned)

Study areas were constructed to the dimensions outlined in the Pilot Study Report, with their locations adjusted to minimize disturbance while still representing the same soil and burn history characteristics

(Figure 9). Large standing dead thatch of black mustard (*Brassica nigra*) and London rocket *(Sisymbrium irio)* was manually removed from seeded plots prior to treatment, as suggested in the Pilot Study Report.

3.2.2 Block and Plot Design

A total of eight blocks was established in each Freeborn property study area (Figure 10). The study design originally prescribed disk tillage to half of the blocks in each study area. However, significant stands of black mustard from previous years were present in all of the Freeborn plots. Additional soil disturbance could exacerbate the spread of this invasive weed. Because of these concerns, it was decided that seedbed preparation would not be conducted in the plots receiving drill seeding or no seeding, and disk tillage with a single pass of knife tillage would be conducted only in the plots that were broadcast seeded. Accordingly, no seedbed preparation treatment was applied at the block level, and different stake colors do not denote different treatments (Table 1). Three seeding plots were established within each block (Figure 10). One plot in each block was drill seeded, one was broadcast seeded, and one was not seeded. Colored flags were placed at either end of each plot to indicate which seeding method was applied (Table 1).

3.3 Diefenderfer Property

3.3.1 Study Variables and Implementation

Three study areas were established on the Diefenderfer property to evaluate the following variables: 1) location within the property, 2) soil seedbed preparation method, and 3) seeding method. The study areas were chosen based on soils (Figure 11):

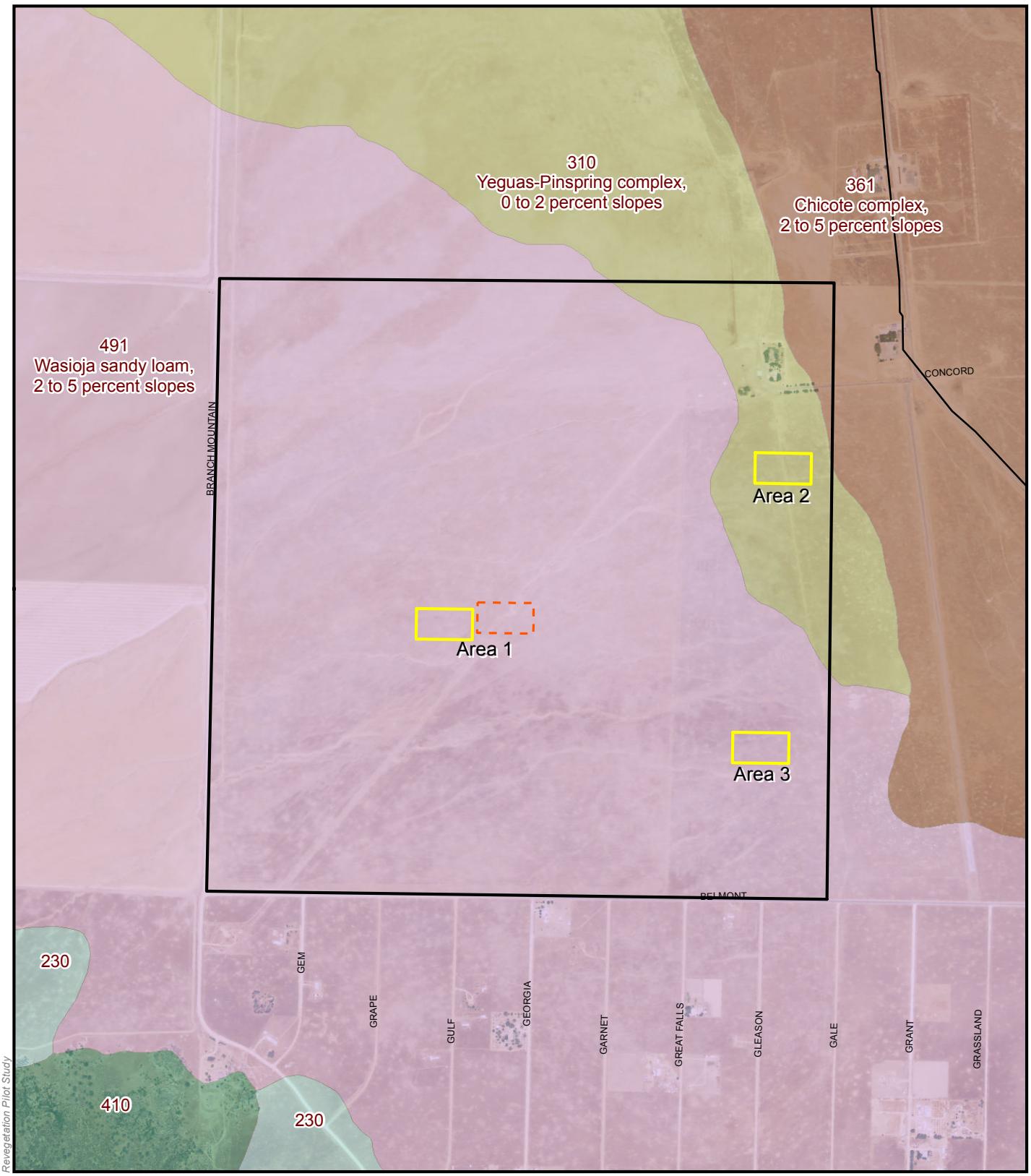
Area 1: southeast portion of the property (Chicote soils)
Area 2: north-central portion of the property, just east of Soda Lake Road (Yeguas-Pinspring complex soils)
Area 3: south-central portion of the property, just west of Soda Lake Road (Yeguas-Pinspring complex soils with pockets of clays)

Study areas were constructed to the dimensions outlined in the Pilot Study Report, with their locations slightly adjusted to minimize disturbance and accommodate site conditions (Figure 11).

3.3.2 Block and Plot Design

A total of eight blocks was established in each Diefenderfer property study area: four designated for future potential herbicidal control of field bindweed, and four that will not receive field bindweed control (Figure 12). Control of field bindweed, planned for late fall 2013, did not occur because the bindweed was severely drought-stressed and low in vigor, precluding effective use of herbicides at that time. If field bindweed resumes vigorous growth in spring 2014, an approved herbicide will be applied in the green-staked control blocks at that time (Table 1).

Each Diefenderfer block contains four plots that received different soil seedbed preparation and seeding treatments (Table 1). As on Freeborn plots, drilled plots and control plots did not receive seedbed preparation, and the Truax broadcast seeder was used only in plots that received disk tillage with a single pass of knife tillage. Also, based on field observations of the existing, desirable friability and tilt of the soils in the Diefenderfer property study areas, HTH staff hypothesized that shrubs could successfully establish from seeds broadcast onto the soil surface without prior soil preparation. This treatment was added to the study design because it minimizes soil disturbance compared to broadcast seeding on disked plots (Figure 12).



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Legend

- Property Boundary
- Approximate Study Areas As-built (not to scale)
- Proposed Study Areas

Soil Codes

- 230
- 310
- 361
- 410
- 491

Data Sources: [1] 1m Natural Color NAIP (2009), [2] Slope derived from USGS 10m DEM data

Scale

1:14,400

1 inch = 1200 ft

0 600 1,200 Feet

Coordinate System: North American Datum 83 Universal Trans Mecator (UTM) Zone 11 North

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Figure 7: Ruskovich Property

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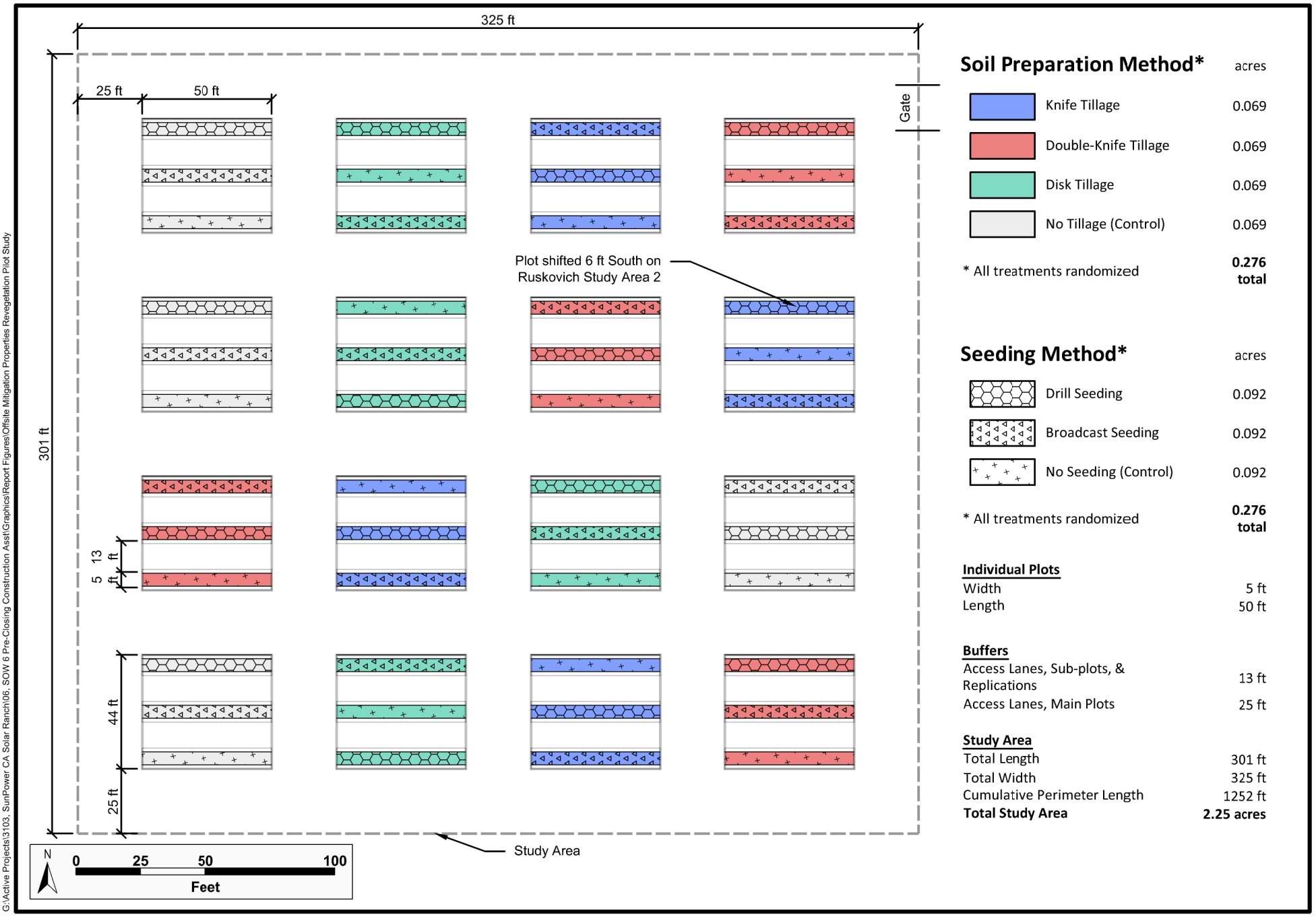

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Figure 8: Ruskovich Property Study Area Layout

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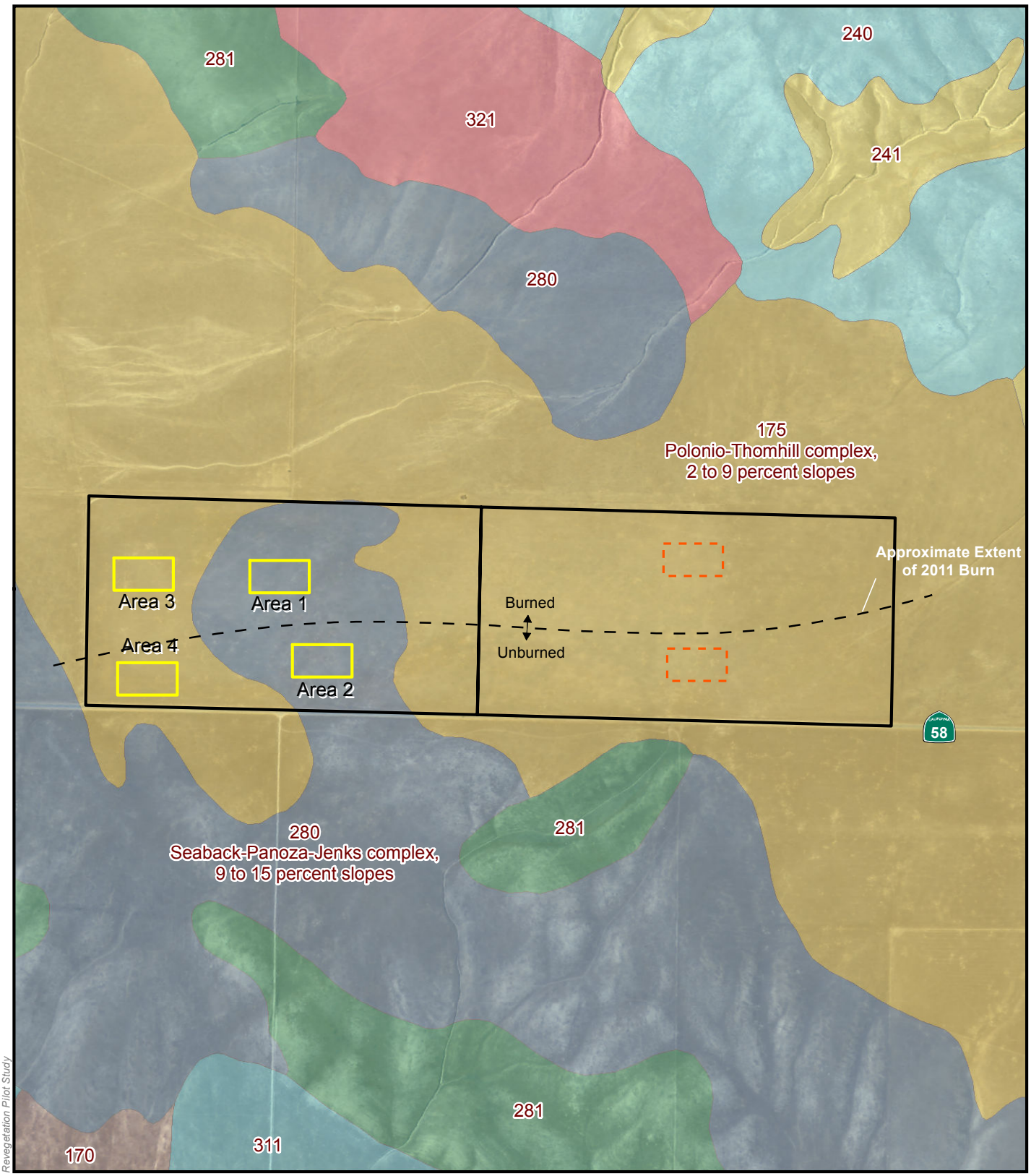
April 2014



Legend

- Property Boundary
- Approximate Study Areas As-built (not to scale)
- Proposed Study Areas

Soil Codes

175	280
240	281
241	311
	321

Data Sources: [1] 1m Natural Color NAIP (2009), [2] Slope derived from USGS 10m DEM data

Scale

1:10,800

1 inch = 900 ft

0 450 900 Feet

Coordinate System: North American Datum 83 Universal Trans Mecator (UTM) Zone 11 North

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Figure 9: Freeborn Property

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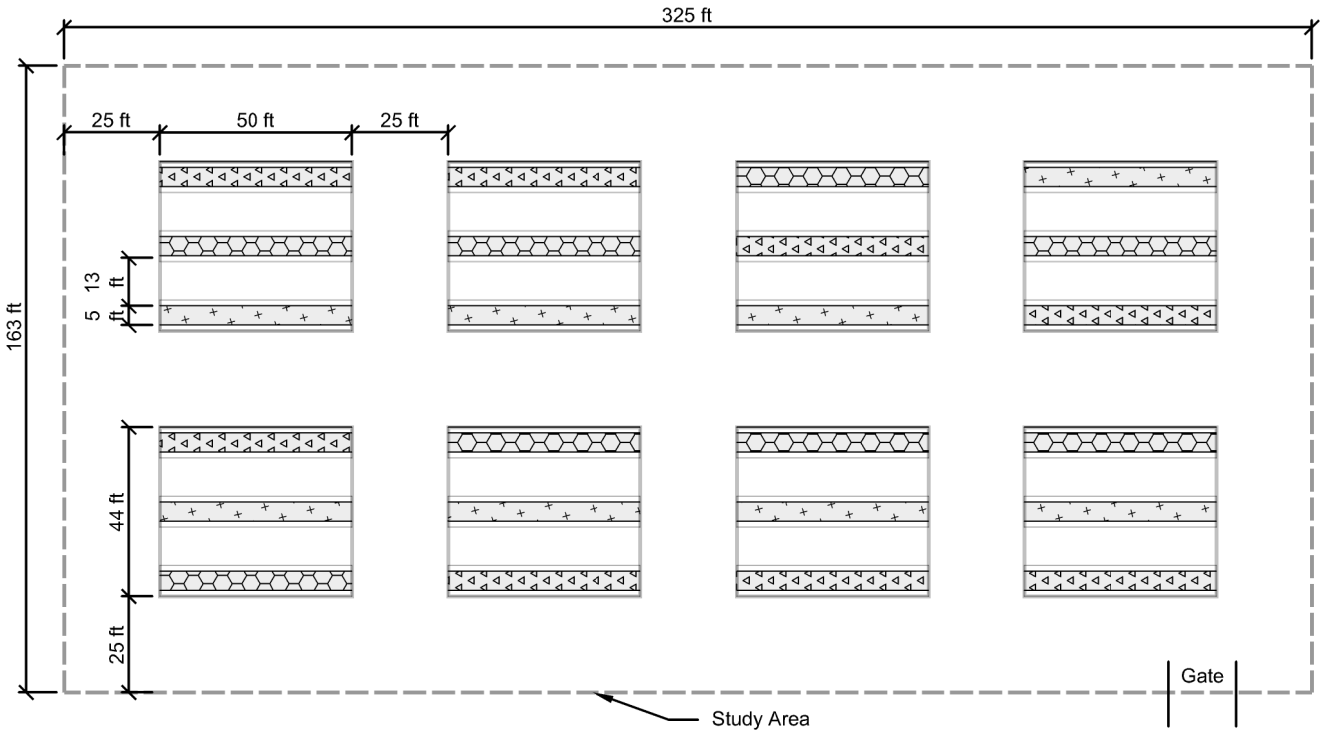

Seeding Method*

	acres
Drill Seeding	0.046
Broadcast Seeding	0.046
No Seeding (Control)	0.046
* All treatments randomized	**0.138 total**

Individual Plots

Width	5 ft
Length	50 ft

Buffers

Access Lanes, Sub-plots, & Replications	13 ft
Access Lanes, Main Plots	25 ft

Study Area

Total Length	163 ft
Total Width	325 ft
Cumulative Perimeter Length	976 ft
Total Study Area	**1.22 acres**

N

0 25 50 100

Feet

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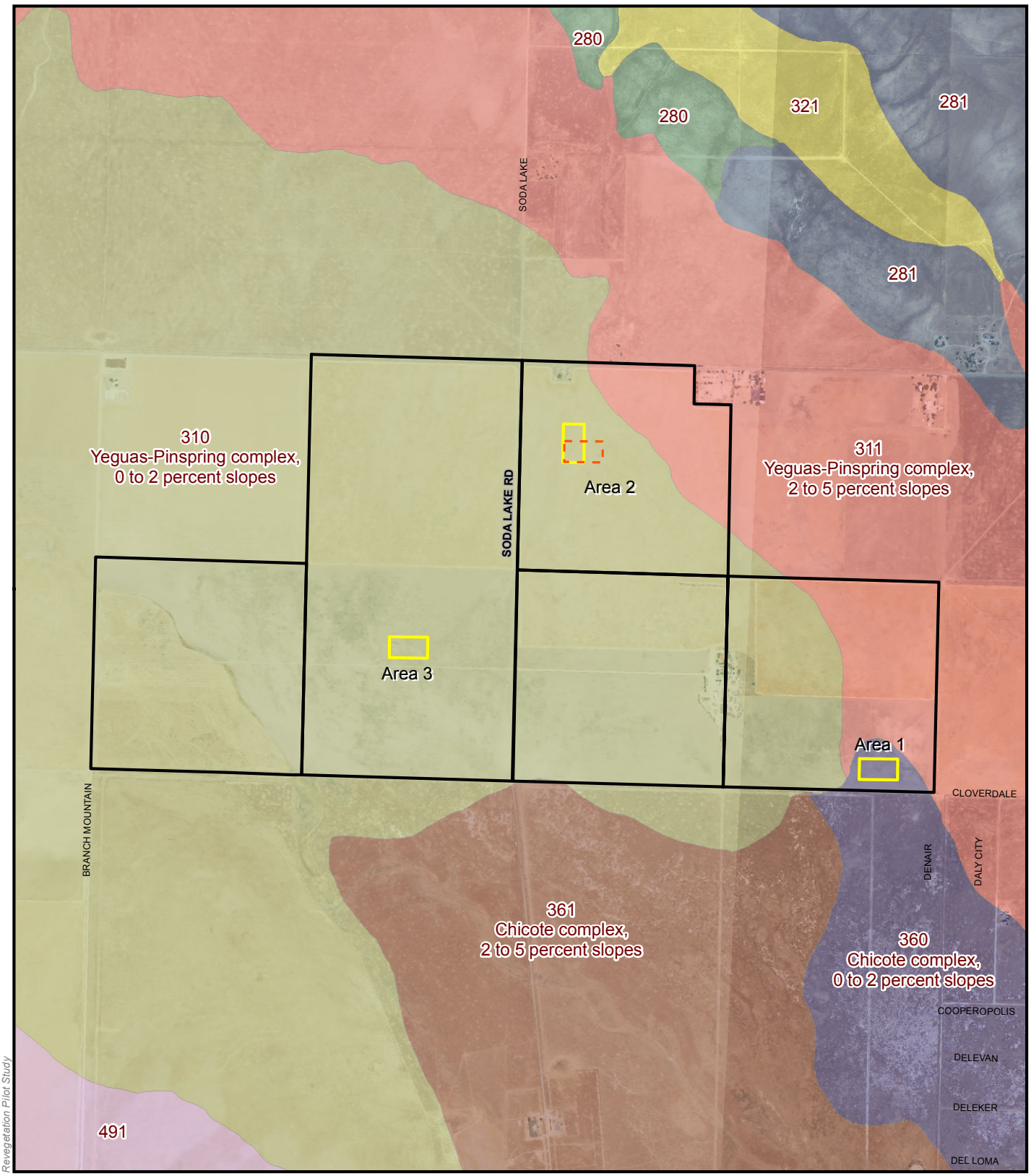
Figure 10: Freeborn Property Study Area Layout

CVSR Offsite Mitigation Properties Pilot Shrub Planting Study (3103-06)

April 2014



Legend

- Property Boundary
- Approximate Study Areas As-built (not to scale)
- Proposed Study Areas

Soil Codes

280, 281, 310, 311, 321, 360, 361, 491

Data Sources: [1] 1m Natural Color NAIP (2009), [2] Slope derived from USGS 10m DEM data

Scale

1:21,000

1 inch = 1,750 ft

0 875 1,750 Feet

Coordinate System: North American Datum 83 Universal Trans Mecator (UTM) Zone 11 North

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Figure 11: Diefenderfer Property

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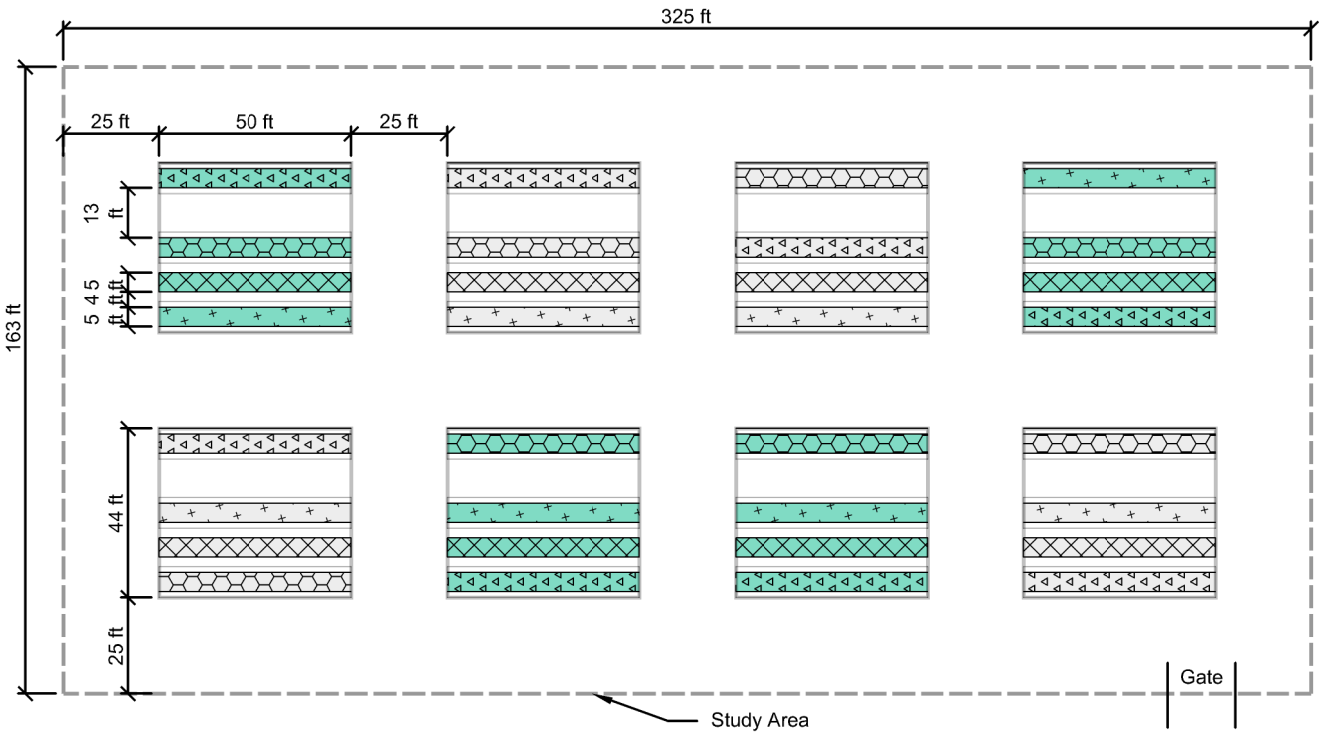

Field Bindweed Management*	acres
Herbicidal Field Bindweed Suppression	0.092
No Field Bindweed Suppression (Control)	0.092
* All treatments randomized	**0.184 total**

Seeding Method*	acres
Drill Seeding (no seedbed preparation)	0.046
Broadcast Seeding (with disk tillage)	0.046
No Seeding (Control)	0.046
Broadcast Seeding (no seedbed preparation)	0.046
* All treatments randomized	**0.184 total**

Individual Plots

Width	5 ft
Length	50 ft

Buffers

Access Lanes, Sub-plots, & Replications	4-13 ft
Access Lanes, Main Plots	25 ft

Study Area

Total Length	163 ft
Total Width	325 ft
Cumulative Perimeter Length	976 ft
Total Study Area	**1.22 acres**

Notes:

1. All Study Areas are oriented as shown on this plan, except for Area 2.
2. Study Area 2 is rotated 90 degrees clockwise. The gate is located on the west side of Study Area 2.

N 0 25 50 100 Feet

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Figure 12: Diefenderfer Property Study Area Layout

CVSR Offsite Mitigation Properties Pilot Shrub Planting Study (3103-06)
April 2014

Section 4.0 Monitoring and Reporting

All work associated with initiation of the Pilot Study was completed on 4 December 2013, and the monitoring period has begun. Monitoring and reporting will be conducted as described in the Pilot Study Report.

Section 5.0 Summary of Adaptive Measures Used during Implementation

The Pilot Study was executed largely as described in the Pilot Study Report. Variations from the specifications of the Pilot Study Report are detailed below.

- Study area locations were modified to facilitate access and minimize disturbance (Figures 7, 9, and 11).
- All fencing installed included four strands of barbed wire to exclude pronghorn, in place of proposed fencing with three strands of barbed wire and a low, unbarbed bottom strand.
- One HOBO weather station was installed in Diefenderfer Study Area 3, and a rain gauge was installed in Freeborn Study Area 4, rather than one weather station being installed on each property (Figure 2).
- Double-knife tillage replaced the proposed chiseling soil seedbed preparation method in the Ruskovich property study areas because the wider chisel blades were unable to penetrate the compacted soils to the desired depth.
- The seed drills used were a Kincaid cone research plot drill and Truax Trillion® broadcast seed drill. As-built plot width was 5 ft rather than the proposed 8 ft because these seed drills were selected (Figures 5 and 6).
- Interior goldenbush was not included in the planting palette because no viable seed was found in the Carrizo Plain region this year. As approved by CDFW, bladderpod was collected from Bakersfield for this study. All other species proposed in the Pilot Study Report were seeded at per-plot rates that maintained seeding density but were altered for seeded plot area (Table 2).
- The mammal herbivory deterrent Plantskydd® was applied to seeded plots and around the perimeter of all study area fences to minimize seed loss.
- Although the Pilot Study Report indicated that half of the blocks in Freeborn property study areas would receive disk tillage, no treatment was applied at the block level on the Freeborn property. This was done to minimize soil disturbance that could encourage weeds (Figure 10).
- To date, no suppression of field bindweed has taken place on the selected Diefenderfer blocks. Measures to control field bindweed on half of the blocks in the Diefenderfer study areas may be implemented in the future if warranted (Figure 12).
- An additional plot was added to each block in all Diefenderfer study areas. The additional blocks were not tilled but were broadcast-seeded. This treatment was added based on field observations of soil quality, suggesting that seeding may succeed without tillage (i.e., with less soil disturbance) (Figure 12).

Section 6.0 Literature Cited

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