| | **Restoration Site:** | QCB Site 1 | Forbland Site 2 | QCB Site 3 | Native Grassland Site 4 | Native Grassland Site 5 | Native Grassland Site 6 | Native Grassland Site 7 |
|---|---|---|---|---|---|---|---|---|
| | **Timing Quarter/Year** | Sycamore Canyon | Sycamore Canyon | Proctor Valley | Rancho Jamul | Rancho Jamul | Sweetwater | Sweetwater |
| Number of Manipulative Treatments (Not including Control Treatment) | --- | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Number of Replicates | --- | 6 | 8 | 6 | 6 | 6 | 6 | 6 |
| OTP Replicates in Sites 4, 6, 7 (Only 1 Treatment) | --- | --- | --- | --- | 6 | --- | 6 | 6 |
| Size of individual test plots (sq ft) | --- | 400 | 1200 | 400 | 5184 | 5184 | 5184 | 2160 |
| Dimensions of Plots (ft) | | 20 x 20 | 24 x 50 Randomly | 20 x 20 | 72 x 72 | 72 x 72 | 72 x 72 | 72 x 30 |
| Dimensions of Pair or Block (ft) | --- | Block 20 x 60 | Assigned | Block 20 x 60 | Paired 72 x 144 | Paired 72 x 144 | Paired 72 x 144 | Paired 72 x 60 |
| Total Number of Manipulative Test Plots | --- | 12 | 16 | 12 | 12 NG and 6 OTP | 12 | 12 NG and 6 OTP | 12 NG and 6 OTP |
| Total Acreage of Manipulative Test Plots | --- | 0.11 QCB | 0.44 Forb | 0.11 QCB | 1.42 NG and 0.71 OTP | 1.42 NG | 1.42 NG and 0.71 OTP | 0.6 NG and 0.3 OTP |
| Non-Test Acreage Remaining to Mow as Buffer Around Restoration Treatments | --- | NA | 10 | NA | 9.9 | 1.9 | 9.2 | 4.2 |
| *Footprint Area of Site* | | *0.11* | *10.44* | *0.11* | *12.03* | *3.32* | *11.33* | *5.1* |
| Total Number of Plots (Manipulate + Control) | --- | 18 | 24 | 18 | 24 | 18 | 24 | 24 |
| Total Number of Stakes (rebar + PVC) | --- | 72 | 96 | 72 | 96 | 72 | 96 | 96 |
| **Site Layout (2013)** | | | | | | | | |
| Staking Layout of Plots (Labor & Material) | 4th 2013 | ✖ | ✖ | ✖ | ✖ | ✖ | ✖ | ✖ |
| **Initial Clearing (2013)** | | | | | | | | |
| Initial Mowing & Clearing of Test Plots | 4th 2013 | ✖ | ✖ | ✖ | ✖ | ✖ | ✖ | ✖ |
| **1st Year Site Prep (2014)** | | | | | | | | |
| 1st Year Hand Weeding in winter w/ follow-up spot spray in spring | 1st & 2nd 2014 | ✖ | --- | ✖ | --- | --- | --- | --- |
| 1st Year Mowing Around Natives (Treatment A - Mow 2x) (winter & spring) | 1st & 2nd 2014 | --- | ✖ | --- | --- | --- | --- | --- |
| 1st Yr Herbicide Glyphosate Broadcast (Treatment B - Herbicide 2x) (winter & spring) | 1st & 2nd 2014 | --- | ✖ | --- | --- | --- | --- | --- |
| 1st Year Herbicide-Fluasifop winter and Glyphosate spring (Treatment A - Full Extent Seeding) | 1st & 2nd 2014 | --- | --- | --- | ✖ | ✖ | ✖ | ✖ |
| 1st Yr Weed Whiping (Treatment B - DeSimone Strips) (winter & spring) | 1st & 2nd 2014 | --- | --- | --- | --- | --- | --- | ✖ |
| 1st Year Mowing (Treatment B - DeSimone Strips) (winter & spring) | 1st & 2nd 2014 | --- | --- | --- | ✖ | ✖ | ✖ | --- |
| Water Truck 1st Yr | --- | ✖ | ✖ | ✖ | ✖ | ✖ | ✖ | ✖ |
| 1st Year Mowing of Buffer Around Test Plots | 1st & 2nd 2014 | --- | ✖ | --- | ✖ | ✖ | ✖ | ✖ |
| **2nd Year Site Prep (2015)** | | | | | | | | |
| 2nd Year Hand Weeding in winter w/ follow-up spot spray in spring | 1st & 2nd 2015 | ✖ | --- | ✖ | --- | --- | --- | --- |
| 2nd Year Mowing Around Natives (Treatment A - Mow 2x) (winter & spring) | 1st & 2nd 2015 | --- | ✖ | --- | --- | --- | --- | --- |
| 2nd Yr Herbicide Glyphosate Broadcast (Treatment B - Herbicide 2x) (winter & spring) | 1st & 2nd 2015 | --- | ✖ | --- | --- | --- | --- | --- |
| 2nd Year Herbicide-Fluasifop winter and Glyphosate spring (Treatment A - Full Extent Seeding) | 1st & 2nd 2015 | --- | --- | --- | ✖ | ✖ | ✖ | ✖ |
| 2nd Yr Weed Whiping (Treatment B - DeSimone Strips) | 1st & 2nd 2015 | --- | --- | --- | --- | --- | --- | ✖ |
| 2nd Year Mowing (Treatment B - DeSimone Strips) (winter & spring) | 1st & 2nd 2015 | --- | --- | --- | ✖ | ✖ | ✖ | --- |
| Water Truck 2nd Yr | --- | --- | ✖ | --- | --- | --- | --- | --- |
| 2nd Year Mowing of Buffer Around Test Plots | 1st & 2nd 2015 | --- | ✖ | --- | ✖ | ✖ | ✖ | ✖ |
| **Seed Collection, Bulking, Installation** | | | | | | | | |
| Test Plot Seed Collection (S&S Seeds) | All qrts | ✖ | ✖ | ✖ | ✖ | ✖ | ✖ | ✖ |
| Test Plot seeding (fall 2015) | 4th 2015 | ✖ | ✖ | ✖ | ✖ | ✖ | ✖ | ✖ |
| OTP seed incease (Recon) | 4th 2013-3rd 2015 | --- | --- | --- | ✖ | --- | ✖ | ✖ |

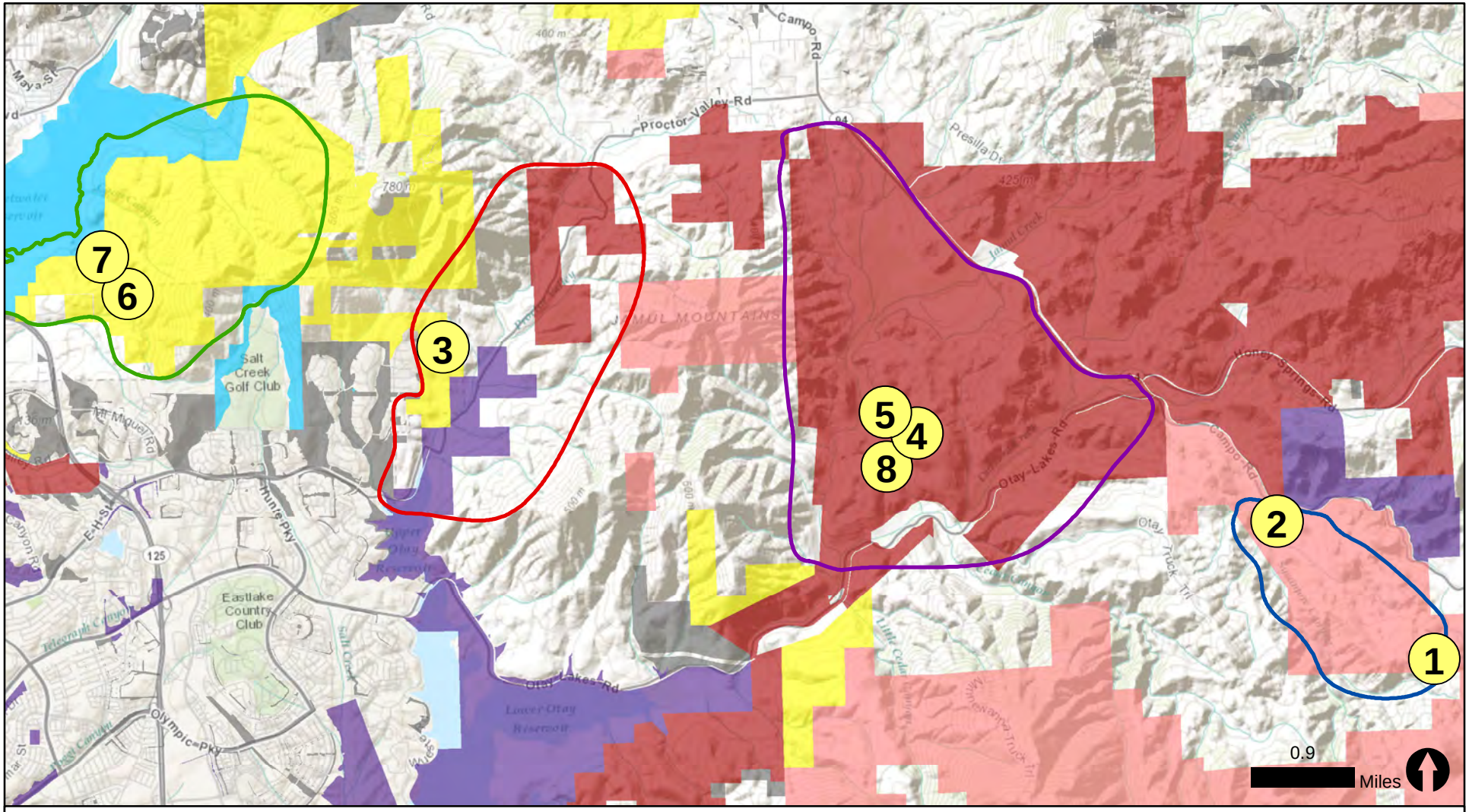


**Figure 1.** Phase 2 Habitat Restoration Experiment Site Locations.

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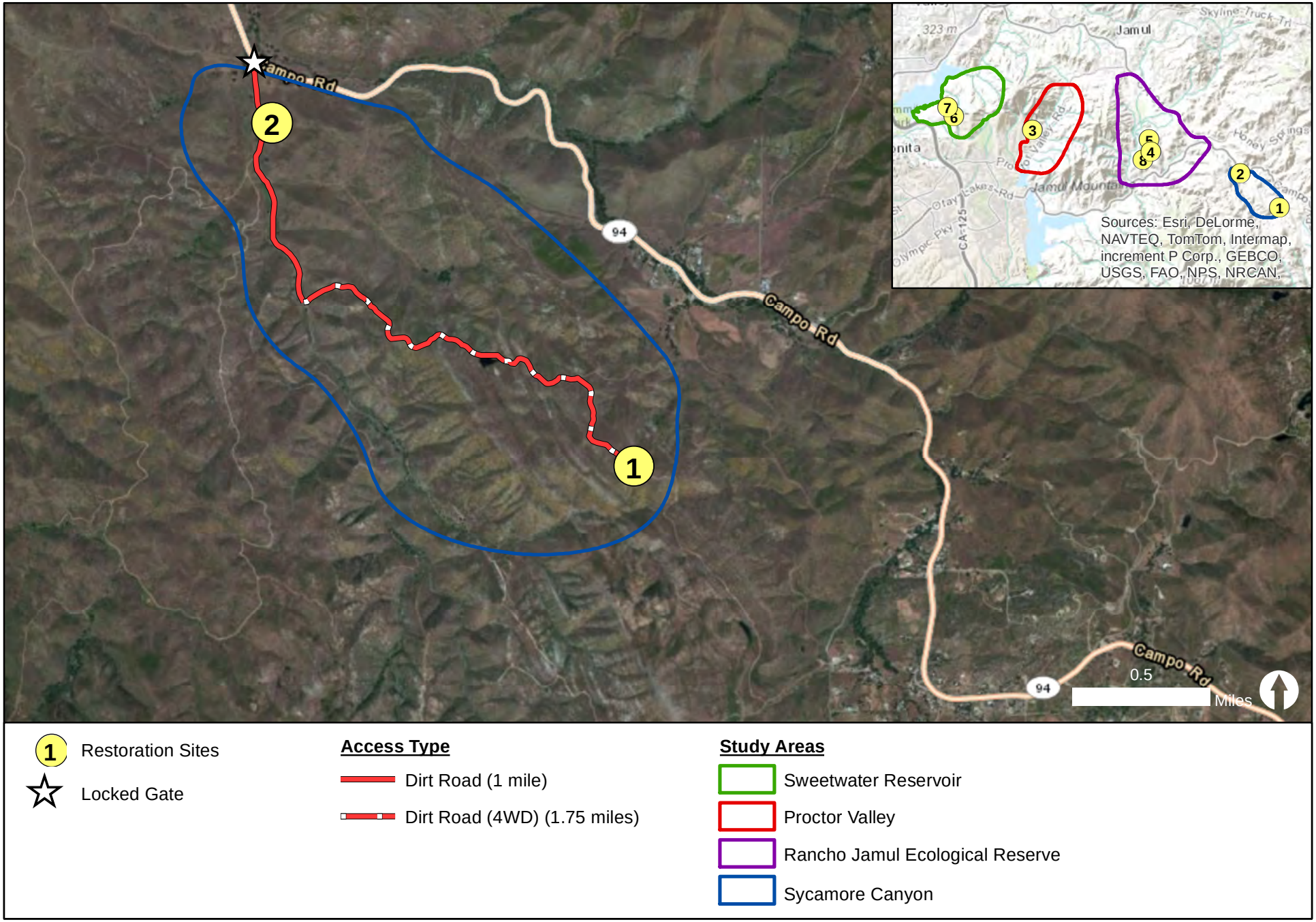


**Figure 2.** Sycamore Canyon Access to Restoration Sites 1 and 2.

LAND IQ

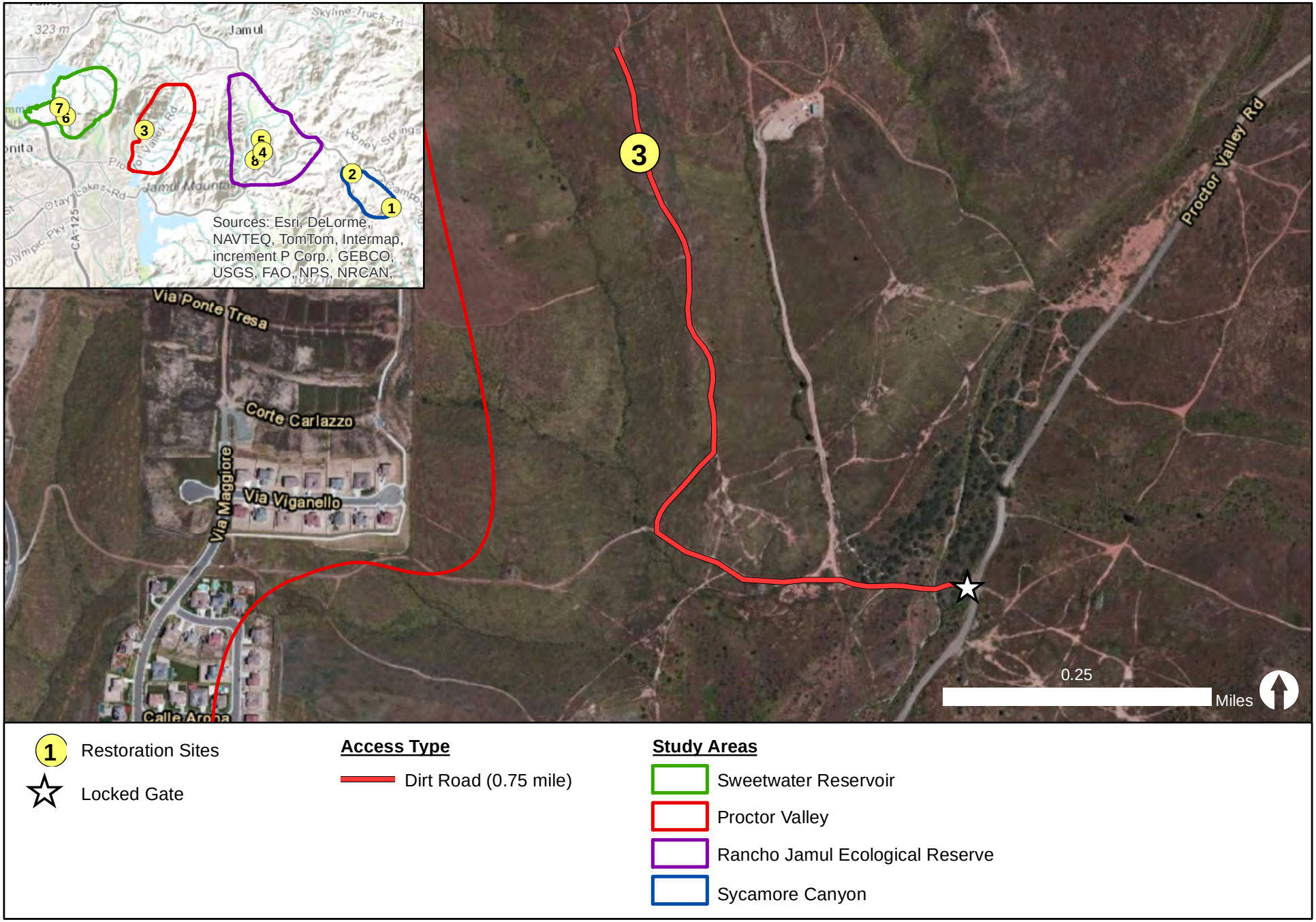


**Figure 3.** Proctor Valley Access to Restoration Site 3.

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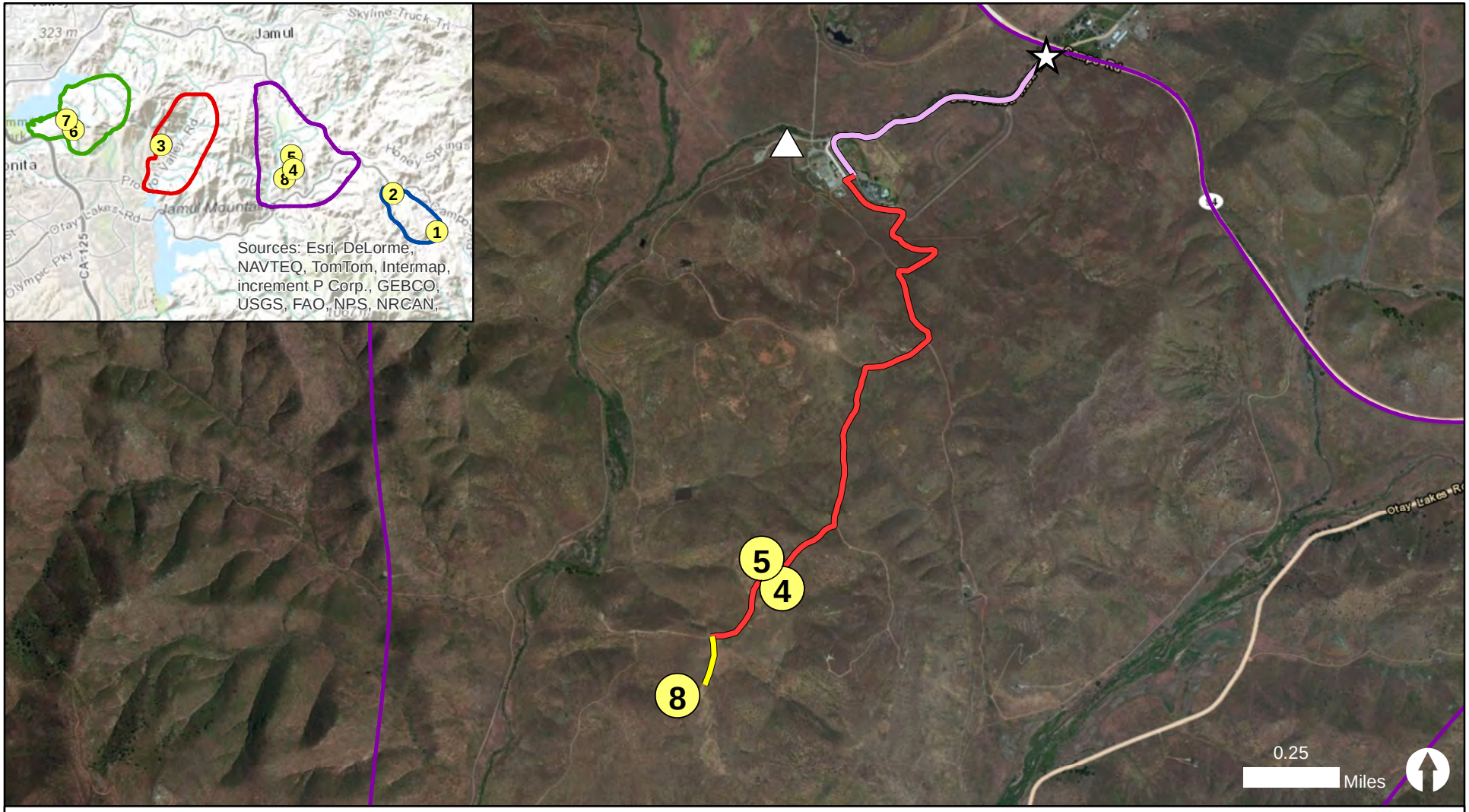



**Figure 4.** Rancho Jamul Ecological Reserve Access to Restoration Sites 4, 5 and 8.

LAND IQ

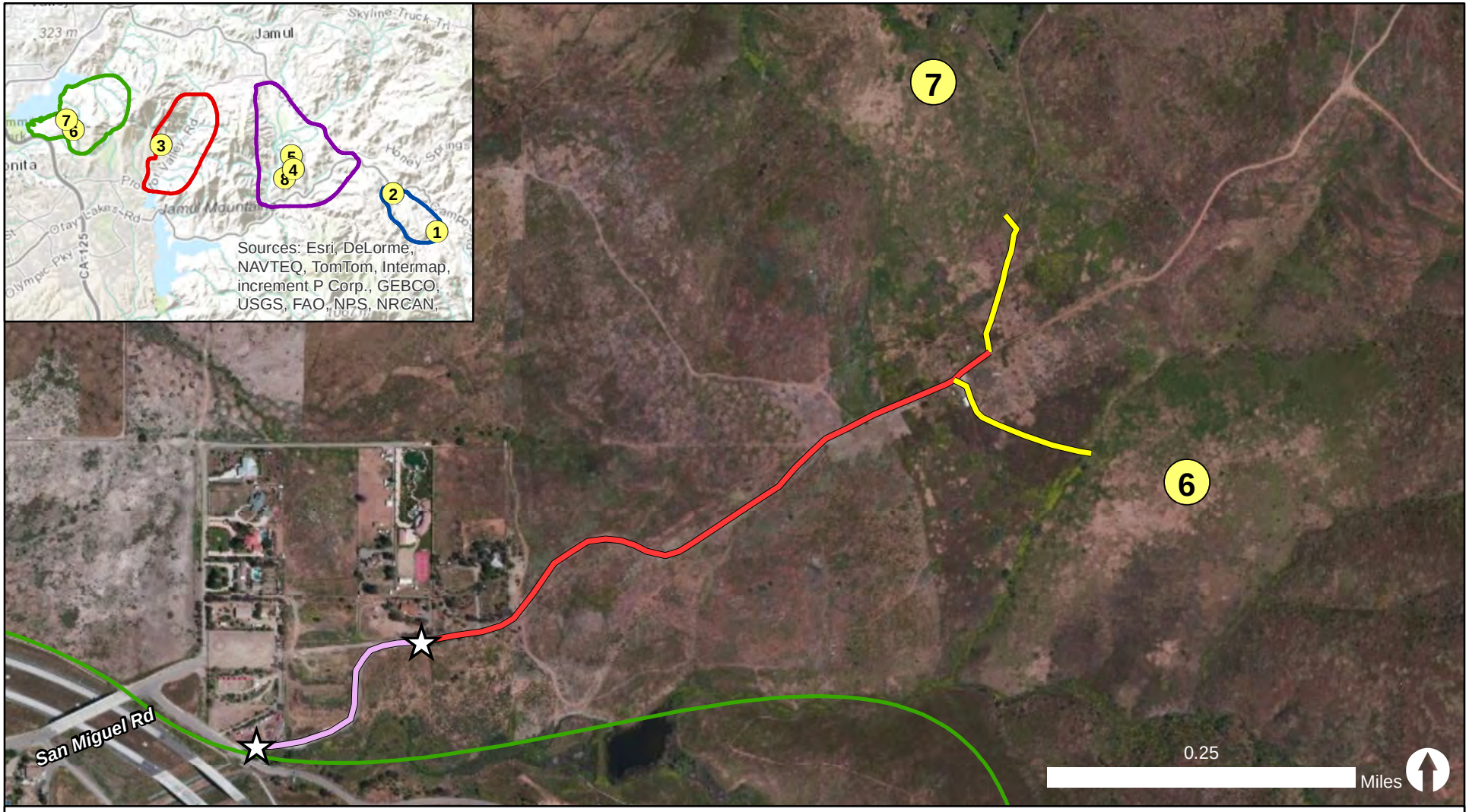
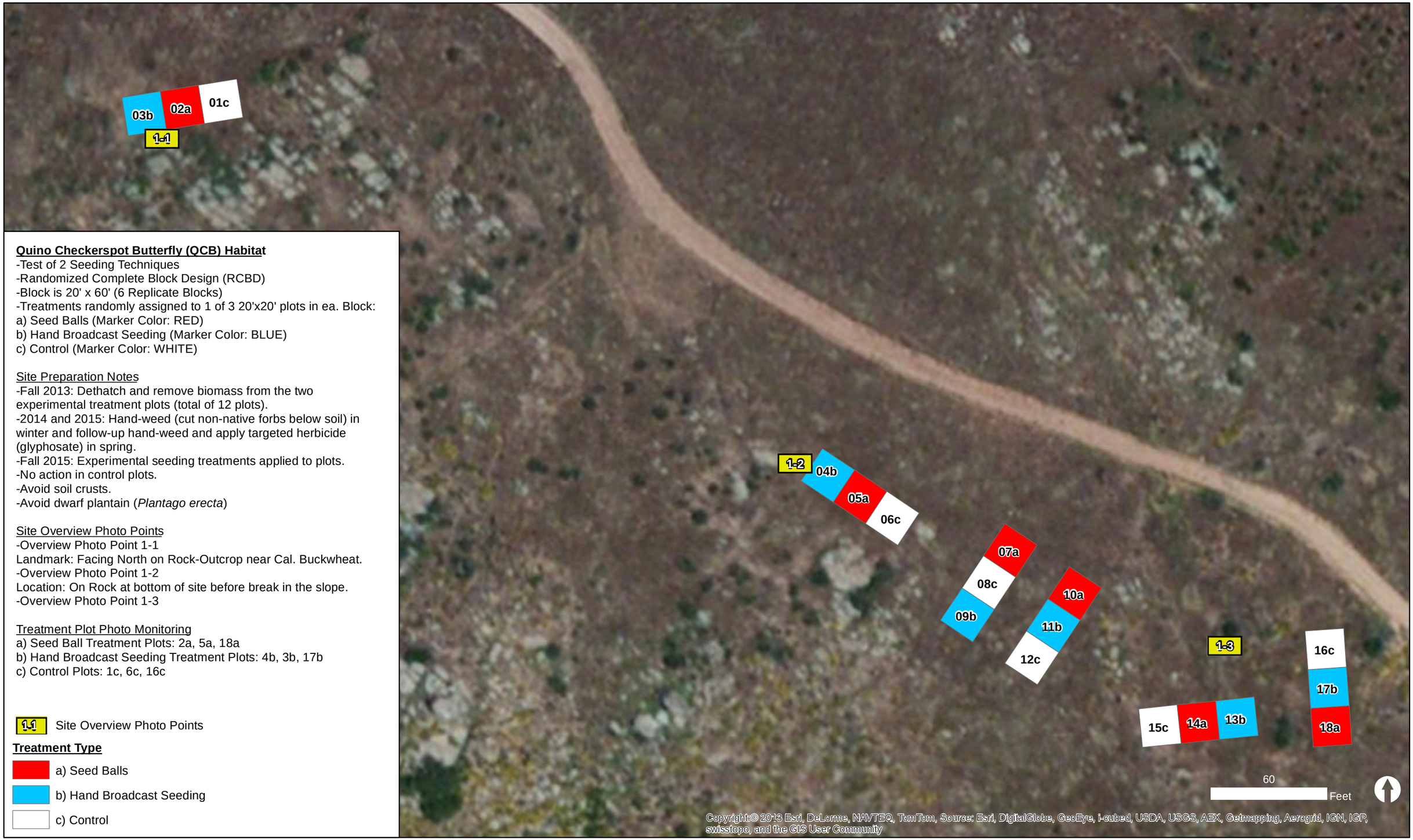



**Figure 5.** Sweetwater Reservoir (USFWS NWR) Access to Restoration Sites 6 and 7.

LAND IQ




**Quino Checkerspot Butterfly (QCB) Habitat**
-Test of 2 Seeding Techniques
-Randomized Complete Block Design (RCBD)
-Block is 20' x 60' (6 Replicate Blocks)
-Treatments randomly assigned to 1 of 3 20'x20' plots in ea. Block:
a) Seed Balls (Marker Color: RED)
b) Hand Broadcast Seeding (Marker Color: BLUE)
c) Control (Marker Color: WHITE)

Site Preparation Notes
-Fall 2013: Dethatch and remove biomass from the two experimental treatment plots (total of 12 plots).
-2014 and 2015: Hand-weed (cut non-native forbs below soil) in winter and follow-up hand-weed and apply targeted herbicide (glyphosate) in spring.
-Fall 2015: Experimental seeding treatments applied to plots.
-No action in control plots.
-Avoid soil crusts.
-Avoid dwarf plantain (*Plantago erecta*)

Site Overview Photo Points
-Overview Photo Point 1-1
Landmark: Facing North on Rock-Outcrop near Cal. Buckwheat.
-Overview Photo Point 1-2
Location: On Rock at bottom of site before break in the slope.
-Overview Photo Point 1-3

Treatment Plot Photo Monitoring
a) Seed Ball Treatment Plots: 2a, 5a, 18a
b) Hand Broadcast Seeding Treatment Plots: 4b, 3b, 17b
c) Control Plots: 1c, 6c, 16c

1-1 Site Overview Photo Points

**Treatment Type**

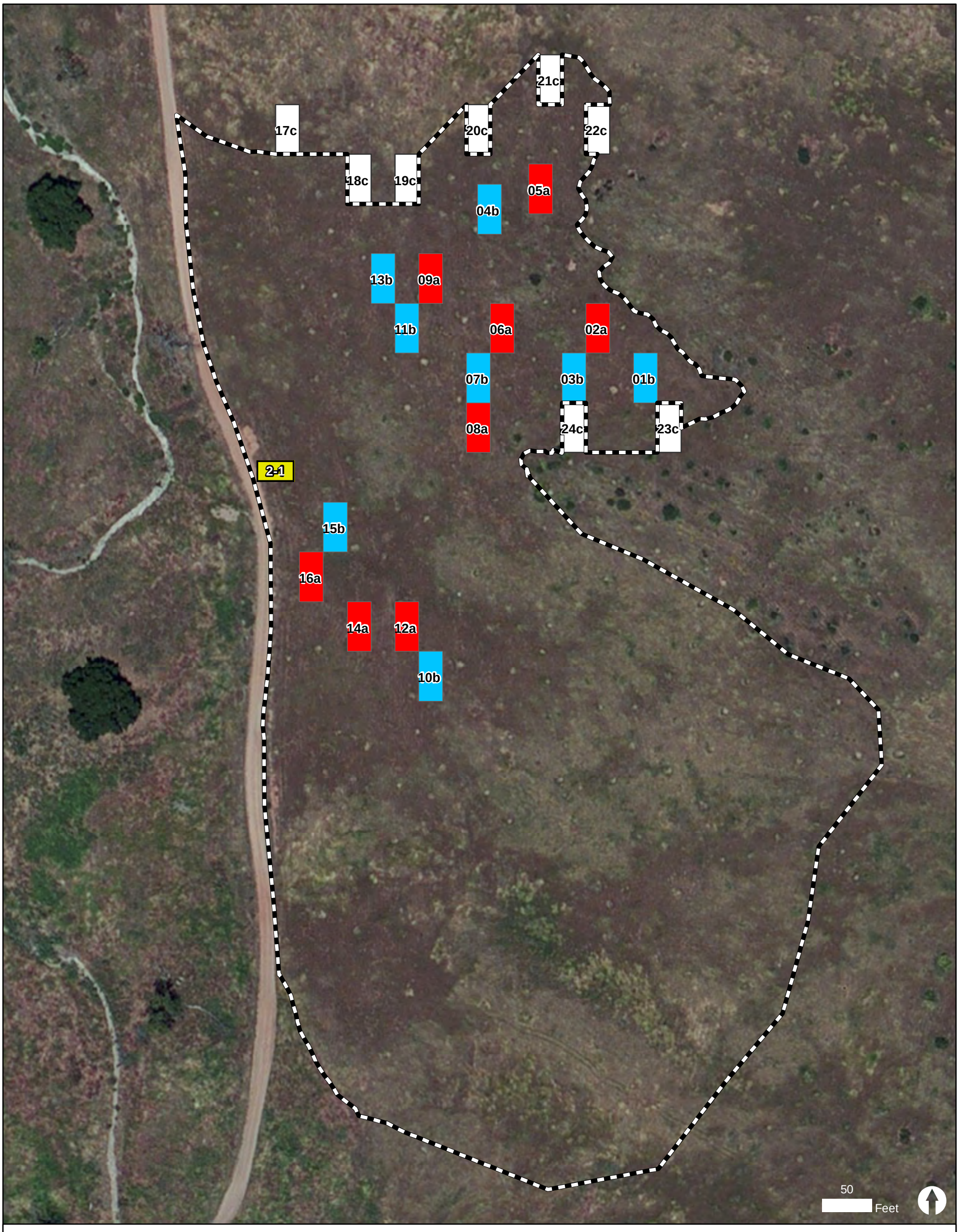
a) Seed Balls

b) Hand Broadcast Seeding

c) Control

**Figure 6.** Sycamore Canyon Quino Checkerspot Butterfly Habitat Restoration Site 1.

LAND IQ




**Forbland Habitat**
-Test of 2 Site Preparation Methods
-Test Plot is 24' x 50' (8 Replicates)
-Plots randomly selected within identified area
-Treatments randomly assigned to test plots
-Control located outside mow buffer
a) Mow and Leave Thatch (Winter and Spring), Selective glyphosate in application in spring (Marker Color: RED)
b) Herbicide (Winter and Spring) (Marker Color: BLUE)
c) Control (Marker Color: WHITE)

Site Preparation Notes
-Fall 2013: Dethatch and remove biomass from experimental treatment plots (total of 16 plots).
-2014 and 2015: 1 of 2 Treatments applied.
-And, Mow 10 acre buffer 2x/year (winter and spring), leave thatch.
-Fall 2015: Broacast pull-type seeder.
-No action in control plots.
-Avoid soil crusts.

Site Overview Photo Points
-Overview Photo Point 2-1
Landmark: At edge of road, approx. in line with sycamore to the west across the drainage.

Treatment Plot Photo Monitoring
a) Mow 2x Plots: 2a, 8a, 12a
b) Herbicide 2x Plots: 1b, 3b, 9b, 13b
c) Control Plots: 17c, 19c, 22c, 23c

2-1 Site Overview Photo Points

**Treatment Type**
a) Mow 2x
b) Herbicide 2x
c) Control
Mow Buffer Boundary

**Figure 7.** Sycamore Canyon Forbland Restoration Site 2.

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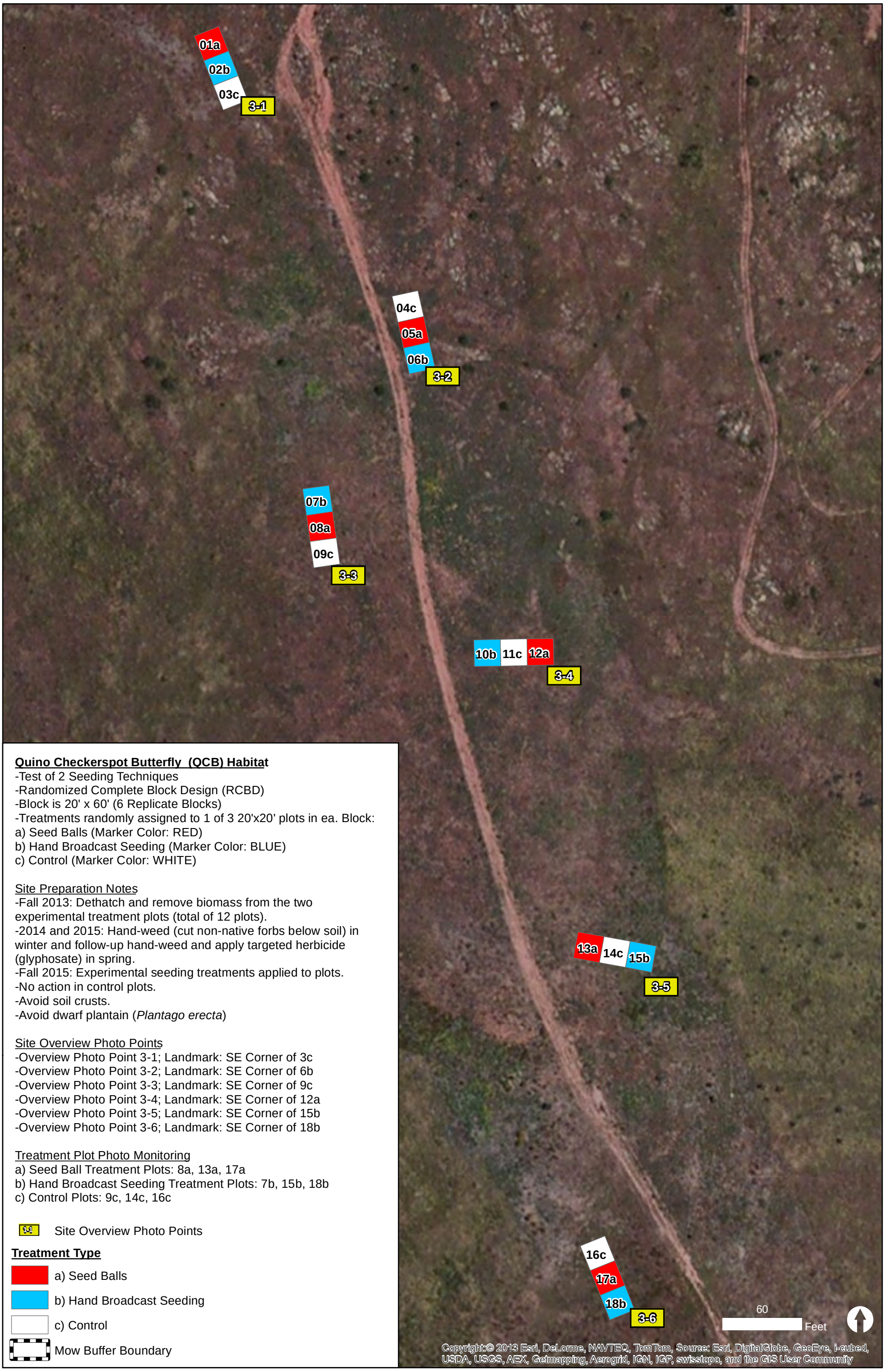


**Quino Checkerspot Butterfly (QCB) Habitat**
-Test of 2 Seeding Techniques
-Randomized Complete Block Design (RCBD)
-Block is 20' x 60' (6 Replicate Blocks)
-Treatments randomly assigned to 1 of 3 20'x20' plots in ea. Block:
a) Seed Balls (Marker Color: RED)
b) Hand Broadcast Seeding (Marker Color: BLUE)
c) Control (Marker Color: WHITE)

Site Preparation Notes
-Fall 2013: Dethatch and remove biomass from the two experimental treatment plots (total of 12 plots).
-2014 and 2015: Hand-weed (cut non-native forbs below soil) in winter and follow-up hand-weed and apply targeted herbicide (glyphosate) in spring.
-Fall 2015: Experimental seeding treatments applied to plots.
-No action in control plots.
-Avoid soil crusts.
-Avoid dwarf plantain (*Plantago erecta*)

Site Overview Photo Points
-Overview Photo Point 3-1; Landmark: SE Corner of 3c
-Overview Photo Point 3-2; Landmark: SE Corner of 6b
-Overview Photo Point 3-3; Landmark: SE Corner of 9c
-Overview Photo Point 3-4; Landmark: SE Corner of 12a
-Overview Photo Point 3-5; Landmark: SE Corner of 15b
-Overview Photo Point 3-6; Landmark: SE Corner of 18b

Treatment Plot Photo Monitoring
a) Seed Ball Treatment Plots: 8a, 13a, 17a
b) Hand Broadcast Seeding Treatment Plots: 7b, 15b, 18b
c) Control Plots: 9c, 14c, 16c

1-1 Site Overview Photo Points

**Treatment Type**

a) Seed Balls

b) Hand Broadcast Seeding

c) Control

Mow Buffer Boundary

**Figure 8.** Proctor Valley Quino Checkerspot Butterfly Habitat Restoration Site 3.

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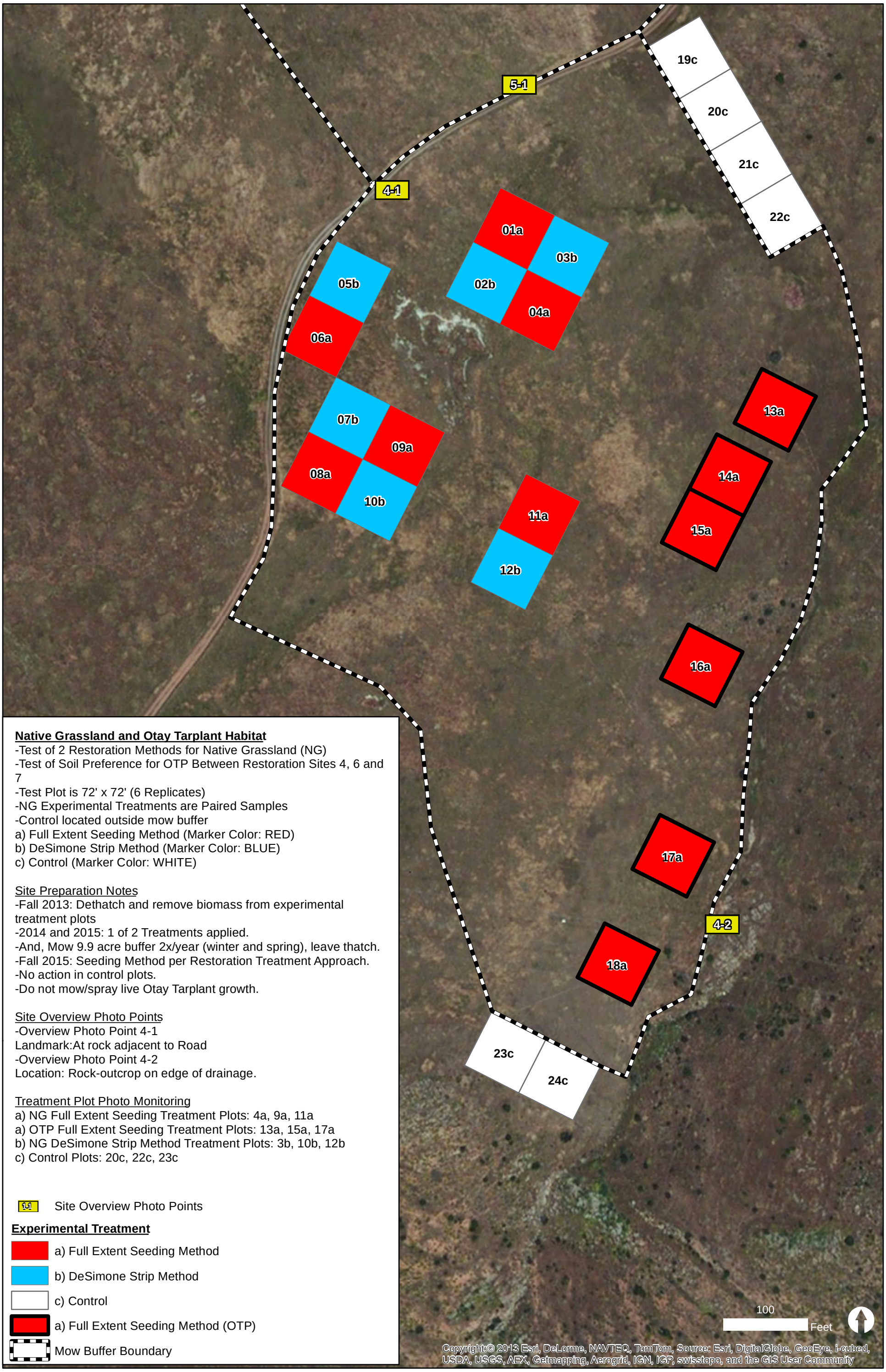



**Native Grassland and Otay Tarplant Habitat**
-Test of 2 Restoration Methods for Native Grassland (NG)
-Test of Soil Preference for OTP Between Restoration Sites 4, 6 and 7
-Test Plot is 72' x 72' (6 Replicates)
-NG Experimental Treatments are Paired Samples
-Control located outside mow buffer
a) Full Extent Seeding Method (Marker Color: RED)
b) DeSimone Strip Method (Marker Color: BLUE)
c) Control (Marker Color: WHITE)

Site Preparation Notes
-Fall 2013: Dethatch and remove biomass from experimental treatment plots
-2014 and 2015: 1 of 2 Treatments applied.
-And, Mow 9.9 acre buffer 2x/year (winter and spring), leave thatch.
-Fall 2015: Seeding Method per Restoration Treatment Approach.
-No action in control plots.
-Do not mow/spray live Otay Tarplant growth.

Site Overview Photo Points
-Overview Photo Point 4-1
Landmark:At rock adjacent to Road
-Overview Photo Point 4-2
Location: Rock-outcrop on edge of drainage.

Treatment Plot Photo Monitoring
a) NG Full Extent Seeding Treatment Plots: 4a, 9a, 11a
a) OTP Full Extent Seeding Treatment Plots: 13a, 15a, 17a
b) NG DeSimone Strip Method Treatment Plots: 3b, 10b, 12b
c) Control Plots: 20c, 22c, 23c

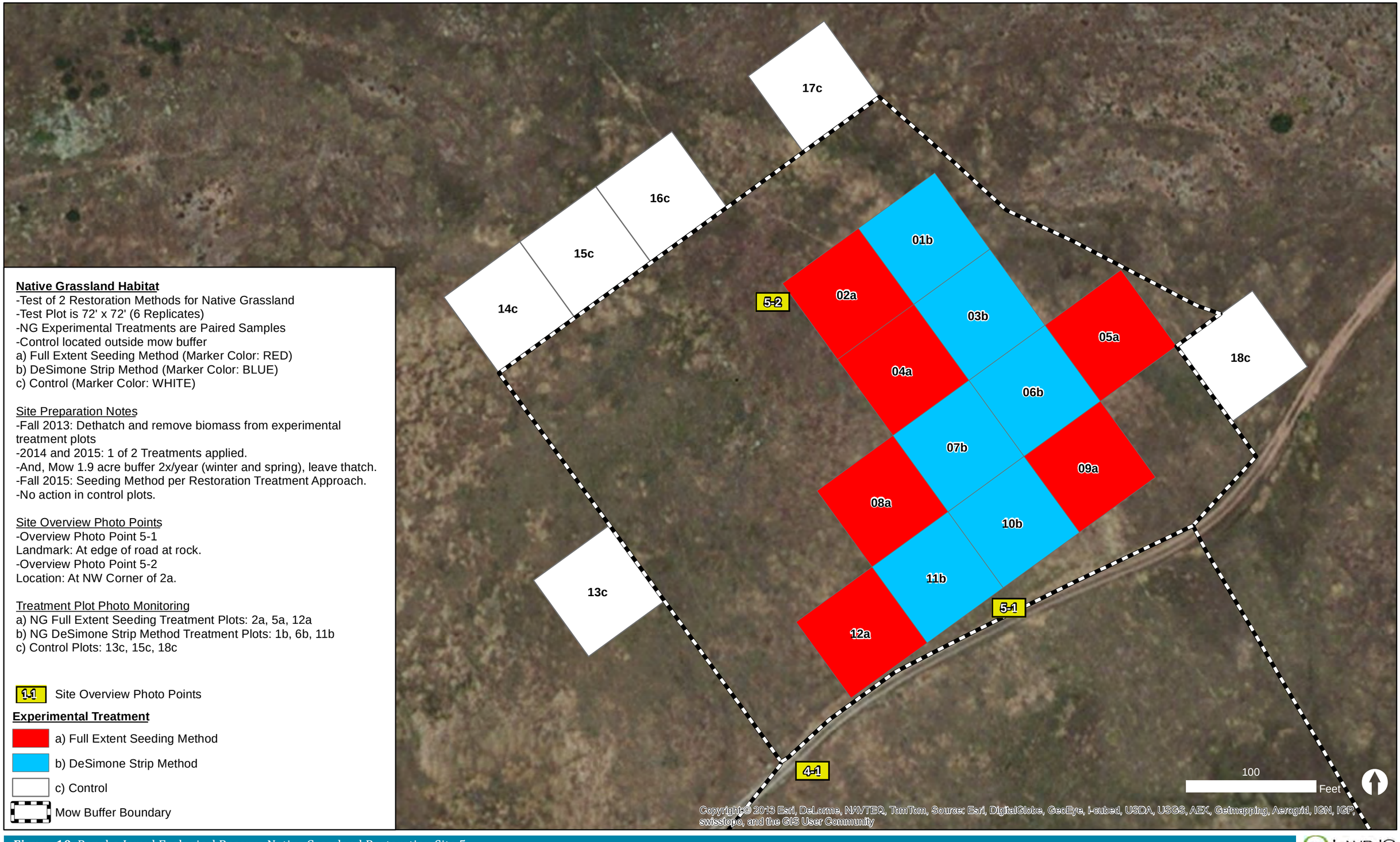
4-1 Site Overview Photo Points

**Experimental Treatment**

a) Full Extent Seeding Method
b) DeSimone Strip Method
c) Control
a) Full Extent Seeding Method (OTP)
Mow Buffer Boundary

**Figure 9.** Rancho Jamul Ecological Reserve Native Grassland and Otay Tarplant Habitat Restoration Site 4.

LAND IQ




**Native Grassland Habitat**
-Test of 2 Restoration Methods for Native Grassland
-Test Plot is 72' x 72' (6 Replicates)
-NG Experimental Treatments are Paired Samples
-Control located outside mow buffer
a) Full Extent Seeding Method (Marker Color: RED)
b) DeSimone Strip Method (Marker Color: BLUE)
c) Control (Marker Color: WHITE)

Site Preparation Notes
-Fall 2013: Dethatch and remove biomass from experimental treatment plots
-2014 and 2015: 1 of 2 Treatments applied.
-And, Mow 1.9 acre buffer 2x/year (winter and spring), leave thatch.
-Fall 2015: Seeding Method per Restoration Treatment Approach.
-No action in control plots.

Site Overview Photo Points
-Overview Photo Point 5-1
Landmark: At edge of road at rock.
-Overview Photo Point 5-2
Location: At NW Corner of 2a.

Treatment Plot Photo Monitoring
a) NG Full Extent Seeding Treatment Plots: 2a, 5a, 12a
b) NG DeSimone Strip Method Treatment Plots: 1b, 6b, 11b
c) Control Plots: 13c, 15c, 18c

1-1 Site Overview Photo Points

**Experimental Treatment**

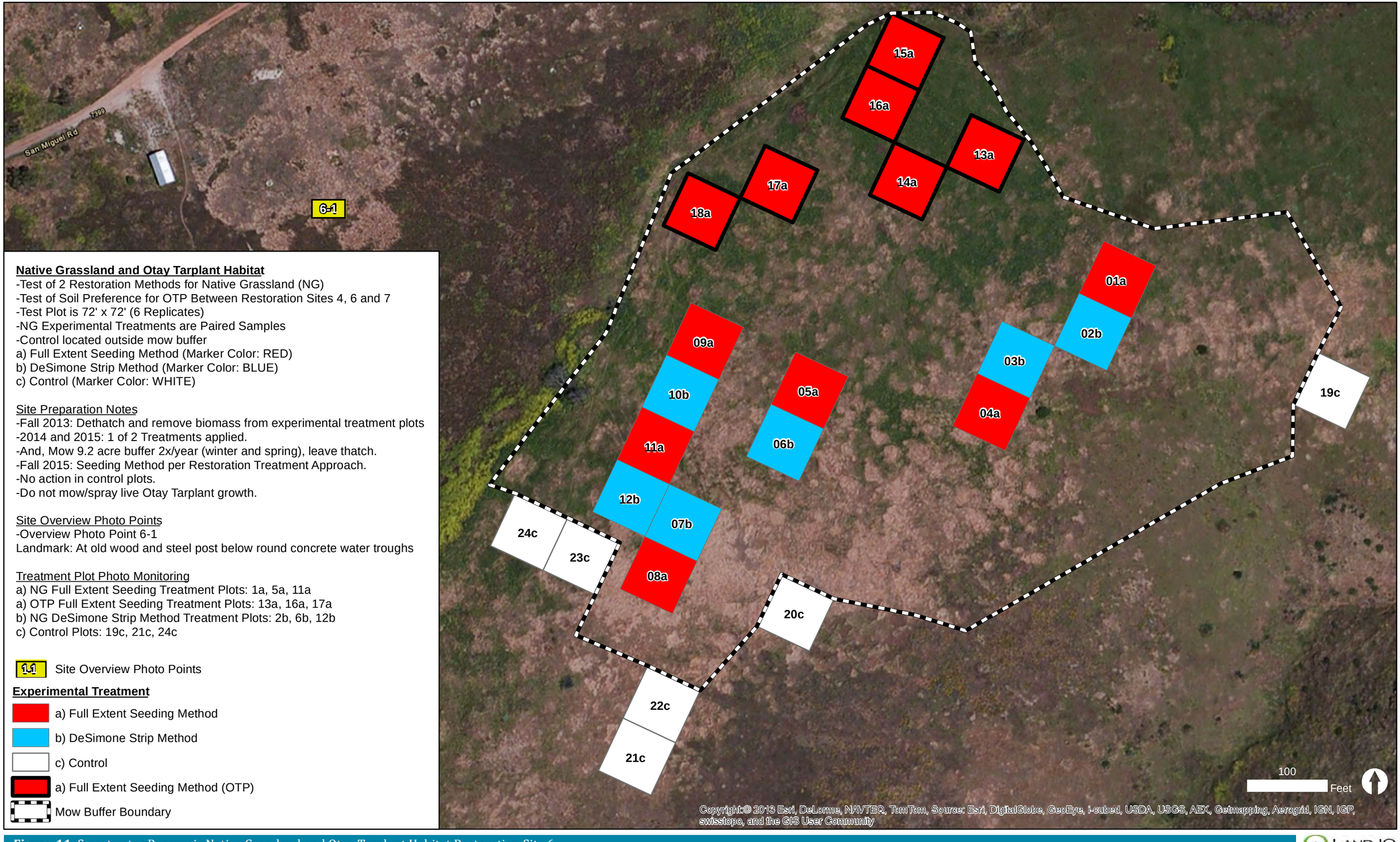
a) Full Extent Seeding Method

b) DeSimone Strip Method

c) Control

Mow Buffer Boundary

**Figure 10.** Rancho Jamul Ecological Reserve Native Grassland Restoration Site 5.




**Native Grassland and Otay Tarplant Habitat**
-Test of 2 Restoration Methods for Native Grassland (NG)
-Test of Soil Preference for OTP Between Restoration Sites 4, 6 and 7
-Test Plot is 72' x 72' (6 Replicates)
-NG Experimental Treatments are Paired Samples
-Control located outside mow buffer
a) Full Extent Seeding Method (Marker Color: RED)
b) DeSimone Strip Method (Marker Color: BLUE)
c) Control (Marker Color: WHITE)

Site Preparation Notes
-Fall 2013: Dethatch and remove biomass from experimental treatment plots
-2014 and 2015: 1 of 2 Treatments applied.
-And, Mow 9.2 acre buffer 2x/year (winter and spring), leave thatch.
-Fall 2015: Seeding Method per Restoration Treatment Approach.
-No action in control plots.
-Do not mow/spray live Otay Tarplant growth.

Site Overview Photo Points
-Overview Photo Point 6-1
Landmark: At old wood and steel post below round concrete water troughs

Treatment Plot Photo Monitoring
a) NG Full Extent Seeding Treatment Plots: 1a, 5a, 11a
a) OTP Full Extent Seeding Treatment Plots: 13a, 16a, 17a
b) NG DeSimone Strip Method Treatment Plots: 2b, 6b, 12b
c) Control Plots: 19c, 21c, 24c

1-1 Site Overview Photo Points

**Experimental Treatment**

a) Full Extent Seeding Method
b) DeSimone Strip Method
c) Control
a) Full Extent Seeding Method (OTP)
Mow Buffer Boundary

**Figure 11.** Sweetwater Reservoir Native Grassland and Otay Tarplant Habitat Restoration Site 6.

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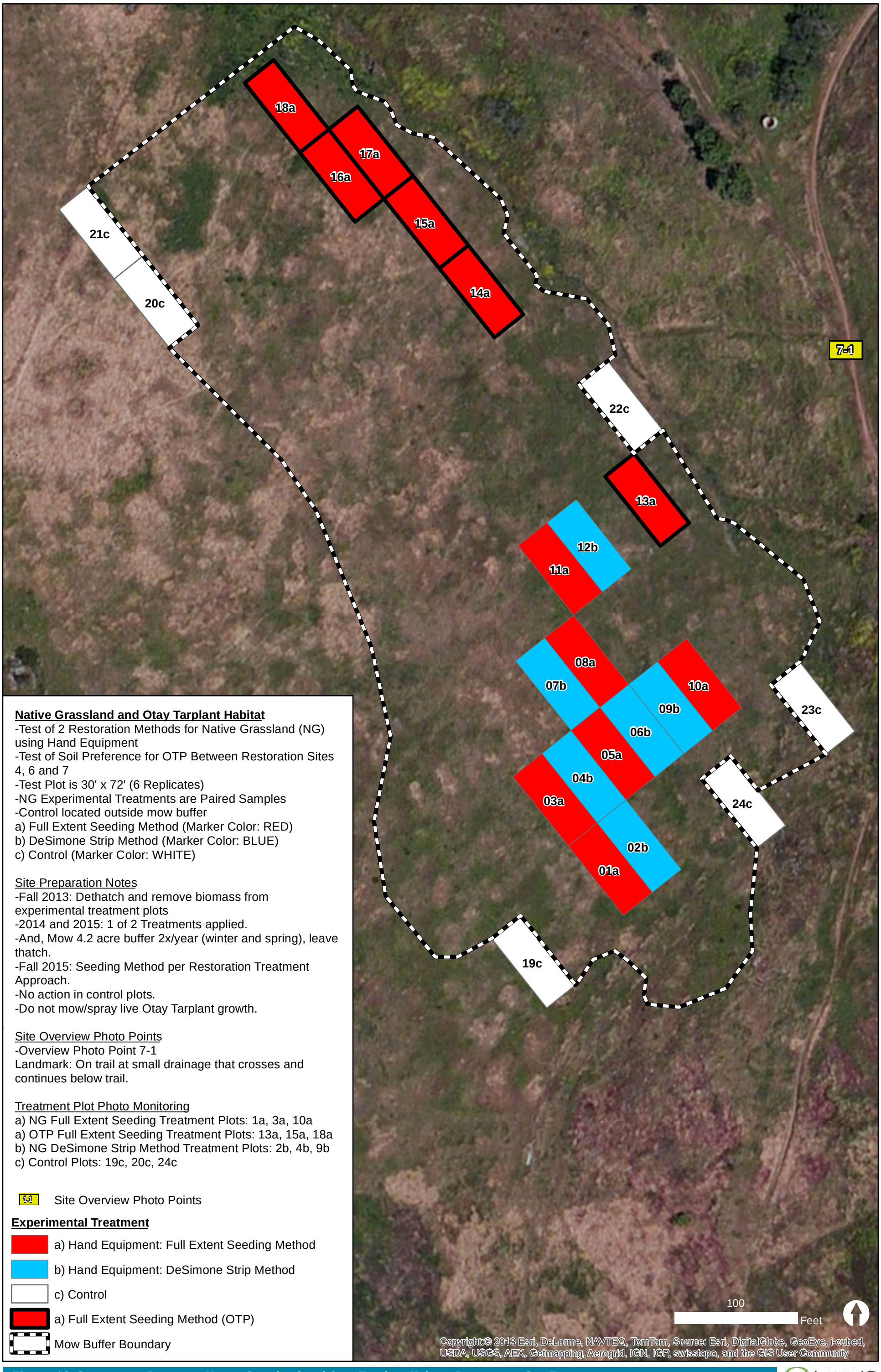


**Native Grassland and Otay Tarplant Habitat**
-Test of 2 Restoration Methods for Native Grassland (NG) using Hand Equipment
-Test of Soil Preference for OTP Between Restoration Sites 4, 6 and 7
-Test Plot is 30' x 72' (6 Replicates)
-NG Experimental Treatments are Paired Samples
-Control located outside mow buffer
a) Full Extent Seeding Method (Marker Color: RED)
b) DeSimone Strip Method (Marker Color: BLUE)
c) Control (Marker Color: WHITE)

Site Preparation Notes
-Fall 2013: Dethatch and remove biomass from experimental treatment plots
-2014 and 2015: 1 of 2 Treatments applied.
-And, Mow 4.2 acre buffer 2x/year (winter and spring), leave thatch.
-Fall 2015: Seeding Method per Restoration Treatment Approach.
-No action in control plots.
-Do not mow/spray live Otay Tarplant growth.

Site Overview Photo Points
-Overview Photo Point 7-1
Landmark: On trail at small drainage that crosses and continues below trail.

Treatment Plot Photo Monitoring
a) NG Full Extent Seeding Treatment Plots: 1a, 3a, 10a
a) OTP Full Extent Seeding Treatment Plots: 13a, 15a, 18a
b) NG DeSimone Strip Method Treatment Plots: 2b, 4b, 9b
c) Control Plots: 19c, 20c, 24c

7-1 Site Overview Photo Points

**Experimental Treatment**

a) Hand Equipment: Full Extent Seeding Method

b) Hand Equipment: DeSimone Strip Method

c) Control

a) Full Extent Seeding Method (OTP)

Mow Buffer Boundary

**Figure 12.** Sweetwater Reservoir Native Grassland and Otay Tarplant Habitat Restoration Site 7.

LAND IQ

**Table 1.** Summary of Experimental Treatments by Habitat Type.

## A. QCB, Test of Seeding Technique

| | Restoration Site: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| a) | Seed Balls [Fall 2015] | 0.055 | --- | 0.055 | --- | --- | --- | --- |
| b) | Hand Seed [Fall 2015] | 0.055 | --- | 0.055 | --- | --- | --- | --- |

***Site Preparation Notes:*** *No test of site preparation methods based on previous work (Dodero) and site conditions. The following will be conducted across the site:*
*A. Dethatch and remove biomass with hand tools from seeding sites (primarily non-native forbs like Erodium sp.) [Fall 2013]*
*Then, conduct site preparation for 2 years: B. Hand weeding in winter (cut off non native forbs just below soil, avoiding crust areas.) [2014 and 2015]*

***Analysis Notes:*** *Can compare techniques within each unique, but fairly similar sites (1 and 3); can compare technique results between sites 1 and 3 if divergent performance; or pool data across sites 1 and 3 if no significant difference by site for each method.*

## B. Forbland, Test of Site Preparation Method

| | Restoration Site: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| a) | Mow 2x (winter and spring), leave thatch, and as necessary apply non-selective herbicide (glyphosate) in spring [2014 and 2015] | --- | 0.22 | --- | --- | --- | --- | --- |
| b) | Mechanized application of non-selective herbicide (glyphosate) in winter and spring/summer, with no hand weeding [2014 and 2015] | --- | 0.22 | --- | --- | --- | --- | --- |

***Site Preparation Notes:*** *Dethatch with mechanical mowing and remove biomass (mechanized to the extent the site allows) [Fall 2013]*
***Seeding Notes:*** *There will be no test of seeding methods. Use the same seed mix over the site, and seed with a broadcast pull-behind type seeder. [Fall 2015]*

***Analysis Notes:*** *Compare site preparation methods within Site 2.*

## C. Native Grassland, Test of Two Types of Mechanized Restoration Methods

| | Restoration Site: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| a) | Full Extent Seeding Method: Grass selective herbicide (Fluazifop) in winter for annual grasses followed by non-selective (glyphosate) in spring [2014 and 2015]; And, apply seed by two-way drill seeding (perpendicular passes) over entire plot. [Fall 2015] | --- | --- | --- | 0.71 | 0.71 | 0.71 | --- |
| b) | DeSimone Strip Method: Mow prior to annual grass at 'milk stage' and repeat mowing to control broad leafs later in spring [2014 and 2015]; And, apply seed with one-way drill seeding, leaving mowed unseeded buffer strips [Fall 2015] | --- | --- | --- | 0.71 | 0.71 | 0.71 | --- |

***IMPORTANT Background Notes:*** *CDFW treated NG areas in Sites 4 and 5 in Mar/Apr 2013 with Fusilade and conducted follow up mowing for broadleaf weeds. OTP area (lower slope of Area 4 was not treated) not treated. (Modification of original proposal to include an extra year of site prep. in NG restoration with and without fire pre-treatment at Sites 4 and 5 only)*

***Site Preparation Notes:*** *Dethatch with mechanical mowing and biomass removal [Fall 2013].*
***IMPORTANT Seeding Notes:*** *Although the seeding application methods are different (one- vs. two-way drill seeding), we must apply seed at the same density per unit area (aka 'at the same rate'). So a DeSimone Strip has the same density as the Full Extent seeded areas. As a result, there will be more total seed applied in the Full Extent Seeding Method, since the entire area will be seeded, but this is intentional as the DeSimone Strip Method is evaluating resources efficiencies by reducing the intensity of seeding and site prep over the same amount of area (with the goal of the same Long Term habitat value result).*

***Analysis Notes:*** *Can compare performance of methods across all Sites (4, 5 and 6) irrespective of whether it was burned in Fall 2012 or not, followed by CDFW herbicide treatments in spring 2013; can compare method performance within sites if results are divergent based on Site; can compare methods based on whether site was burned (Site 4 in Fall 2012 and subsequently treated with herbicide by CDFW) or not burned recently (Site 5) prior to treatments between sites 4 and 5;and, can compare trajectory of sites 5 and 6 and see if there are Site-related differences in otherwise similar sites in terms of soil and weed cover or pool results to increase statistical power if similar based on qualitative observations and quantitative transect samples.*

**D. Native Grassland, Test of Two Hand-Equipment Restoration Methods**

| | Restoration Site: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| a) | Full Extent Seeding Method by Hand: Grass selective herbicide (Fluazifop) in winter for annual grasses followed by non-selective (glyphosate) in spring, as necessary [2014 and 2015]; And, hand broadcast seed at rate equal to that in strips, over entire plot. [Fall 2015] | --- | --- | --- | --- | --- | --- | 0.3 |
| b) | DeSimone Strip Method by Hand: Hand Mow prior to annual grass at 'milk stage' and repeat mowing to control broad leafs later in spring, as necessary [2014 and 2015]; And, hand broadcast seed in strips with mowed buffers between seeded areas [Fall 2015] | --- | --- | --- | --- | --- | --- | 0.3 |

***This is a test of methods were large equipment is not accessible.***
***Site Preparation Notes:*** *Dethatch with hand mowing and biomass removal [Fall 2013].*
***Seeding Notes:*** *Seed application rates are equal in both methods, but because the entire area is being seeded in the Full Extent Method, then it will require more total seed than the DeSimone Strip Method.*

***Analysis Notes:*** *Can compare relative success of two hand methods used in areas inaccessible for large equipment; and, can compare to equivalent mechanized method at Site 6, although mechanized would always be preferred when available because it is much more cost effective in a large scale restoration implementation project.*

**E. OTP, Test of Soil Differences, Same Full Extent Restoration Methods**

| | Restoration Site: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| a) | Full Extent Seeding Method: Grass selective herbicide (Fluazifop) in winter for annual grasses followed by non-selective (glyphosate) in spring [2014 and 2015]; And, apply seed by two-way drill seeding (perpendicular passes) over entire plot. [Fall 2015] | --- | --- | --- | 0.71 | --- | 0.71 | --- |

***IMPORTANT Background Notes:*** *Areas of elevated lime content and high clay content at Site 4 at Rancho Jamul will be used to compare the effect of calcareous soils on OTP establishment with areas of similarly high clay content at Site 6 at Sweetwater Reservoir. The same restoration method will be applied at both sites across six randomly located replicate plots placed within the target soil conditions.*

***Site Preparation Notes:*** *Dethatch with mechanical mowing and biomass removal [Fall 2013].*
***IMPORTANT Seeding Notes:*** *Seed application rates are equal to the Full Extent Method being used in the Native Grassland Test Plots using two-way drill seeding (used in Sites 4, 5 and 6), with the addition of OTP in the seed mix.*

***Analysis Notes:*** *Can compare establishment of seed mix, including OTP between the two sites, and attribute differences in large part to observed differences in lime in the soil of the test plots. We will bulk soil samples from analysis with the area of interest and used field checks to place test plots in calcareous soils with high clay content at Site 4. But, in the future, additional soil samples could be taken per test plot and used to do regression against densities of OTP and/or the rest of the seed mix, if there are interesting patterns emerging that beg exploration (both within a site and across Sites 4 and 6).*

**F. OTP, Test of Hand to Mechanized Full Extent Restoration Methods**

| | Restoration Site: | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| a) | Full Extent Seeding Method by Hand: Grass selective herbicide (Fluazifop) in winter for annual grasses followed by non-selective (glyphosate) in spring, as necessary [2014 and 2015]; And, hand broadcast seed at rate equal to that in Native Grassland Test Plots in Site 7, over entire plot. [Fall 2015] | --- | --- | --- | --- | --- | The Same Plots, as above in Table 2E, Site 6 will be used for comparison | 0.3 |

***This is a test of methods were large equipment is not accessible.***
***Site Preparation Notes:*** *Dethatch with hand mowing and biomass removal [Fall 2013].*
***Seeding Notes:*** *Seed application rates are equal to the Full Extent Method by Hand being used in the Native Grassland Test Plots using hand broadcast seed (used in Site 7), with the addition of OTP in the seed mix.*

***Analysis Notes:*** *Can compare relative success of hand method used in areas inaccessible for large equipment (such as Site 7) to mechanized method in Site 6.*

**Table 1.** Summary of Acreage to be Seeded by Habitat Type.

| Restoration Site: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | **TOTAL** |
|---|---|---|---|---|---|---|---|---|
| Total Area at each site to be seeded in Manipulative Test Plots (Acres) | 0.11 | 0.44 | 0.11 | 2.13 | 1.42 | 2.13 | 0.9 | 7.24 |
| Area to be seeded by Habitat Type (Acres): | | | | | | | | |
| QCB | 0.11 | --- | 0.11 | --- | --- | --- | --- | **0.22** |
| Forbland | --- | 0.44 | --- | --- | --- | --- | --- | **0.44** |
| Native Grassland | --- | --- | --- | 1.42 | 1.42 | 1.42 | 0.6 | **4.86** |
| OTP | --- | --- | --- | 0.71 | --- | 0.71 | 0.3 | **1.72** |

| Preserve | Owner | Land Manager | Phone Number | Entrance Location | Type of Access | Access Code/Notes |
|---|---|---|---|---|---|---|
| Rancho Jamul Ecological Reserve | California Department of Fish and Wildlife | Tracie Nelson | 858-735-7109 | Main gate to Rancho Jamul Ecological Reserve (State Route 94). | Electric gate with keypad. | Enter: #2081 onto keypad. |
| Proctor Valley | United States Fish and Wildlife Service | John Martin | 619-468-9245 x227 | Proctor Valley Road at Yellow Gate | Open access. | Use key provided by John Martin to access the second gate with the key lock. |
| Sweetwater Refuge | United States Fish and Wildlife Service | John Martin | 619-468-9245 x227 | Main gate to the old San Miguel Ranch Rd | 1) electric gate with keypad<br>2) a key lock. | 1) Enter: 3334 onto keypad<br>2) use key provided by John Martin to access the second gate with the key lock. |
| Sycamore Canyon | Bureau of Land Management | Joyce Schlachter | 619.468.3839 | State Route 94 to "Pink" Gate | Key lock | Use key provided by Joyce Schlachter to access the  gate with the key lock. |

Table 1. Phase 2 Restoration Areas and Experimental Treatments.

| **Property** | **Sycamore Canyon** | | **Proctor Valley** | **Rancho Jamul Ecological Reserve** | | | **Sweetwater Reservoir** | |
|---|---|---|---|---|---|---|---|---|
| **Site** | **1** - *Ridgelines* | **2** – *Slopes west of SR-94* | **3** – *Ridgelines and Slopes* | **4** - *Recently Burned Grassland* | **5** - *Adjacent to Burned Grassland* | **8** - *Recently Burned Grassland* | **6** - *NW-Facing Slope* | **7** - *N-Facing Slope* |
| **Associated CBI HAP Polygon UIDs** | 11-2-01 | 11-2-15<br>11-2-11<br>11-2-12<br>11-2-13<br>11-2-14 | 11-4-44 | 11-1-09 | 13-1-85b | NA | 11-3a-04<br>11-3a-06<br>11-3a-02 | 11-3a-29 |
| **Land Owner** | **BLM** | **BLM** | **USFWS** | **CDFW** | **CDFW** | **CDFW** | **USFWS** | **USFWS** |
| **Restoration Target** | | | | | | | | |
| **Quino Checkerspot Butterfly (QCB)** | Treatments within open areas across 1.7 acres | | Treatments within open areas across 10.9 acres | | | | | |
| **Forbland** | | Treatments within 10.5 acres | | | | | | |
| **Otay Tarplant (OTP)** | | | | Treatments for OTP within 3.8 acres of lower slope adjacent to NG restoration area. | | Treatments for OTP within<br><br>3.2-acre historic OTP area (2004 observation) that was burned. | Treatments for OTP within 1 acre at northeast end of NG restoration area. | Treatments for OTP within 0.5-acre lower slope within NG restoration area. |
| **Native Grassland** | | | | Treatments for NG restoration within 2012 Fall burn 8.9 acres of upper slope within 12.7 acres. | Treatments for NG restoration in non-burned area within 2.3 acre site. | | Treatments in non-burned site for NG restoration within 11.3-acres. | Treatments in non-burned site for NG restoration within 5.1-acres. |
| **Existing Conditions** | | | | | | | | |
| **Fire History (100-year Cal Fire Record)** | ---<br>Harris 10/2007<br>---<br>Otay 10/2003<br>Sycamore 8/1995<br>---<br>Honey 8/1976<br>---<br>---<br>--- | ---<br>Harris 10/2007<br>Border 7/2006<br>Otay 10/2003<br>---<br>---<br>---<br>---<br>---<br>--- | ---<br>Harris 10/2007<br>---<br>---<br>---<br>Miller 1985<br>---<br>---<br>Wet Back 1950<br>Wildfire 1911 | Wildfire 6/20/2012<br>Harris 10/2007<br>---<br>Otay 10/2003<br>---<br>---<br>---<br>---<br>---<br>--- | ---<br>Harris 10/2007<br>---<br>Otay 10/2003<br>---<br>---<br>---<br>---<br>---<br>--- | Wildfire 6/20/2012<br>Harris 10/2007<br>---<br>Otay 10/2003<br>---<br>---<br>---<br>---<br>---<br>--- | ---<br>Harris 10/2007<br>---<br>---<br>---<br>---<br>Laguna 9/1970<br>---<br>Wildfire 1911 | ---<br>Harris 10/2007<br>---<br>---<br>---<br>---<br>Laguna 9/1970<br>---<br>Wildfire 1911 |
| **Soil Type & Texture** (USDA 1973) | Friant Series, Ridges and slopes with rock outcrops and very shallow rocky fine sandy loam soils underlain by impervious bedrock | Primarily Escondido loam series; gentle slopes with loam to sandy loam soils | San Miguel-Exchequer rocky silt loam | Bosanko Stony Clay Series<br>Gentle to moderate slopes with clayey soil and common stones. Soil description includes soft lime concretions.<br><br>***Note:*** *Site 4 has limestone (indicates calcareous soils), obvious at the surface, in upper slope. See text.* | | | Diablo Clay Series within larger landscape mapped as San Miguel-Exchequer rocky silt loam | |
| **Existing Habitat** | Good quality CSS, with some cryptobiotic soil crusts. QCB host plant (*Plantago erecta*) observed in some areas per CBI/TNC. | *Nassella pulchra* Association and *Avena (barbata)* Semi-Natural Stands: sparse to no shrub cover, with interspaces dominated by nonnative grasses (*Avena* sp., *Bromus diandrus*), *Erodium* spp., and *Croton setigerus*; some good stands of *Nassella pulchra* | Sparse CSS with good cryptobiotic soil crusts. Interspaces dominated by *Erodium* spp. With native forbs occasional.<br>Some areas were recently subject to restoration treatments, but poor germination rates observed to date.<br>No existing QCB host plants here. | Mapped as *Nassella pulchra* Association pre-2012 fire. Scattered *N. pulchra* growing back after fire. | *N. pulchra* association with high percentage of nonnative grasses, lesser amounts of native and nonnative forbs. | Primarily annual grassland pre-2012 fire with historic populations of OTP documented before 2007 fire. | Mainly annual grasses, but at northeast end of site, *N. pulchra*, many geophytes, *Lessingia filanginifolia*, with scattered *Ferocactus viridescens.* | *N. pulchra*, w/ scattered *Artemisia californica* and *Baccharis sarothroides*. |
| **Weed Load** | Large openings in shrub canopy dominated by exotic forbs (especially *Erodium* spp.) with low annual grass biomass. | Variable; large areas dominated by *Erodium* spp. With lesser amounts of *Croton setigerus*; other areas with heavy grass cover, incl. nonnative (*Avena* spp., *Bromus diandrus*) and native species (*Nassella pulchra* and *N. lepida*). | Large openings in shrub canopy dominated by exotic forbs (especially *Erodium* spp.) with low annual grass biomass. | High percentage of *Brachypodium distachyon* and *Avena barbata*. Existing seedbank likely growing back post 2012 fire. | High percentage of *Avena barbata* and *Bromus diandrus*, with lesser amounts of *Brachypodium distachyon*, and trace amounts *of Vulpia myuros, Lolium multiflorum*, and *Bromus hordeaceus*. | Dominated almost entirely by *Avena* spp. Associated non-native, annual species include: *Bromus diandrus, Bromus madritensis, Brassica nigra, Silybum marianum*, and *Centaurea melitensis.* | Dominated by annual grass, including *Bry. distachyon*, *Bromus hordeaceus* and *Avena* spp., non native forbs also present, including *Raphanus sativus*, *Cynara cardunculus.* | Dominated by annual grass, including *Bry. distachyon*, *Bromus hordeaceus* and *Avena* spp., *Foeniculum vulgare*. |

| **Property** | **Sycamore Canyon** | | **Proctor Valley** | **Rancho Jamul Ecological Reserve** | | | **Sweetwater Reservoir** | |
|---|---|---|---|---|---|---|---|---|
| **Site** | **1** - *Ridgelines* | **2** – *Slopes west of SR-94* | **3** – *Ridgelines and Slopes* | **4** - *Recently Burned Grassland* | **5** - *Adjacent to Burned Grassland* | **8** - *Recently Burned Grassland* | **6** - *NW-Facing Slope* | **7** - *N-Facing Slope* |
| **Ease of Access** | Difficult (4WD) | Easy | Moderate (Poor Dirt Road) | Moderate (Dirt Road) | Moderate (Dirt Road) | Moderate (Dirt Road) | Easy (Maintained) | Moderate, steep rocky |
| **Site-Specific Restoration Methods** | | | | | | | | |
| **Pre-Seeding Site Preparation (2 years: 2014 and 2015)** | No test of site preparation methods based on previous work (Dodero) and site conditions. The following will be conducted across the site:<br><br>1. Dethatch and remove biomass with hand tools from seeding sites (primarily non-native forbs like *Erodium* sp.).<br><br>Then, conduct site preparation for 2 years:<br><br>2. Hand weeding in winter (cut off non native forbs just below soil, avoiding crust areas.)<br><br>3. Apply low dose of non-selective herbicide (Glyphosate) as necessary in spring. | 1. Dethatch with mowing and remove biomass (mechanized to the extent the site allows) in fall 2013.<br><br>Then, test two experimental site preparation treatments, conducted for 2 years each:<br><br>A. Test repeat mowing in winter and spring, leaving thatch; or<br><br>B. Test mechanized herbicide application of non-selective herbicide (Glyphosate) in winter and spring, with no hand weeding. | No test of site preparation methods based on previous work (Dodero) and site conditions. The following will be conducted across the site:<br><br>1. Dethatch in test areas where previous weeding/seeding tests were conducted in the Proctor Valley site. To avoid damaging soil crusts, weed only areas without crust, (e.g. gopher mounds)<br><br>Then, conduct site preparation for 2 years:<br><br>2. Hand weeding in winter (cut off non native forbs just below soil, avoiding crust areas.)<br><br>3. Apply low dose of non-selective herbicide (Glyphosate) as necessary in spring. | 1. Initial mechanical mowing and biomass removal in fall 2013.<br><br>Then, test one of two restoration approaches:<br><br>A. Full Extent Seeding Method: herbicide treatments with fluazifop in Spring and Glyphosate in winter; or<br><br>B. DeSimone strip method: Mow before annual grass seed is at 'milk stage'; with repeat mowing for broad leaf weeds. | | 1. Prescribed burn in October 2012 to create baseline conditions.<br><br>2. Application of Fusilade II in February 2013 to test strips followed by Glyphosate spot-treatments in same test strips.<br><br>3. Mowing of test strips using a rotary mow via tractor attachment. Mowed before annual grass seed was at 'milk stage.'<br><br>4. Mowing of test strips using line trimmers. Mowed before annual grass seed was at 'milk stage.' | See Sites 4 and 5. | This site tests methods for sites where mechanized methods are not possible.<br><br>1. Initial mowing with weed whip and biomass removal in fall 2013.<br><br>Then, test two experimental site preparation methods conducted for 2 years:<br><br>A. Full Extent: Early winter Glyphosate application, followed with Glyphosate in spring, as needed; or<br><br>B. DeSimone: Mow before annual grass seed is at 'milk stage'; with repeat mowing as necessary. |
| **Mowed Buffer (acres) around Restoration Treatments (winter and spring in 2014 and 2015)** | NA | 10 | NA | 9.9 | 1.9 | NA | 9.2 | 4.2 |
| **Seeding Technique (Fall 2015)** | Using the same seed mix, test two seeding methods.<br><br>A. Seed balls; or<br><br>B. Scarification and hand-seeding | There will be no test of seeding methods.<br><br>Use the same seed mix over the site, and seed with a broadcast pull-behind type seeder. | See Site 1. | Using the same seed mix, apply the seed at equal rates:<br><br>A. Full extent: apply by two-way drill seeding (perpendicular passes) over entire plot; or<br><br>B. DeSimone strips: apply with one-way drill seeding, leaving mowed unseeded buffer strips. | | The status of the historic OTP population will be assessed following site preparation treatments and the need for seed additions will be evaluated and a seeding plan developed. | See Sites 4 and 5. | Using the same seed mix, apply the seed at equal rates:<br><br>A. Full Extent: Hand broadcast see at rate equal to that in strips; or<br>B. DeSimone: Hand broadcast in strips with mowed buffers between seeded areas. |
| **Equipment-Type List** | Hand Tools only | Track Loader, Tractor with Scraper, New Holland DC-80 Dozer, Hyundai Wheel Loader | Hand Tools only | Track Loader, Tractor with Scraper, New Holland DC-80 Dozer, Hyundai Wheel Loader | | NA | Track Loader, Tractor with Scraper, New Holland DC-80 Dozer, Hyundai Wheel Loader | Hand Tools only |
| **Mowing Specifications** | Hand Weed Eaters to less than 4 inches and Removal Weed material from Restoration | Flail Mower to less than 4 inches; however, adjustments will be made depending on | Hand Weed Eaters to less than 4 inches and Removal Weed material from Restoration | Flail Mower to less than 4 inches; however, adjustments will be made depending on the surface rock content within the mowed buffer area. | | NA | Flail Mower to less than 4 inches; however, adjustments will be made depending on | Hand Weed Eaters to less than 4 inches and Removal Weed material from Restoration |

| Property | Sycamore Canyon | | Proctor Valley | Rancho Jamul Ecological Reserve | | | Sweetwater Reservoir | |
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| | Plots | the surface rock content within the mowed buffer area. | Plots | | | | the surface rock content within the mowed buffer area. | Plots |
| **Timing of Implementation** | See Implementation and Maintenance Weeding Schedules in the Restoration Specifications Document (dated 5/29/2013). | | | | | | | |
| **Access Routes** | Using Established Access Roads, then hand crews access site from road | Using Established Access Roads, Site is directly adjacent to access road | Using Established Access Roads, then hand crews access site from road | Using Established Access Roads, Sites are directly adjacent to access road | | NA | Using Established Access Roads, then across disturbed annual grassland to access Site 6 | Using Established Access Roads, then hand crews access site from road |
| **Staging Areas** | TBD, Probably can be staged at RJER | TBD, On-site or at RJER | TBD, Probably can be staged at RJER | TBD | | NA | TBD | TBD |
| **Herbicide Application** | Herbicide treatment with non-selective Glyphosate (ie RoundUp Pro at 1.5-2.0 percent) for all weeds in winter (1 application) at Site 2 and spring/summer (1 application) at Sites 1, 2 and 3 for 2 years (2014 and 2015). Herbicide shall be applied according to the recommended application rate on the herbicide label for wildlands. Herbicide treatment shall be conducted only when weather conditions are conducive to effective uptake of the herbicide by the target species (e.g. sunny, dry with ambient temperatures at least 65 degrees Fahrenheit) and when plants are at the specified growth stage. Wind conditions should be five mph or less to minimize herbicide drift. Treated plants shall not be disturbed until the applied herbicide has had time to take effect per the manufacturer's instruction.<br><br>Dye: Non-Toxic brightly colored dye (ie Blazon or Turfmark) shall be mixed with the herbicide at no more than half the rate specified on the label. | | | Herbicide application for two years (2014 and 2015): selective Fluazifop-p-butyl (ie Fusilade) applied in winter for annual grasses; and, non-selective Glyphosate (RoundUp Pro at 1.5-2.0 percent) for all weeds in spring. Herbicide shall be applied according to the recommended application rate on the herbicide label for wildlands. Herbicide treatment shall be conducted only when weather conditions are conducive to effective uptake of the herbicide by the target species (e.g. sunny, dry with ambient temperatures at least 65 degrees Fahrenheit) and when plants are at the specified growth stage. Wind conditions should be five mph or less to minimize herbicide drift. Treated plants shall not be disturbed until the applied herbicide has had time to take effect per the manufacturer's instruction.<br><br>Dye: Non-Toxic brightly colored dye (ie Blazon or Turfmark) shall be mixed with the herbicide at no more than half the rate specified on the label. | | NA | Herbicide application for two years (2014 and 2015): selective Fluazifop-p-butyl (ie Fusilade) applied in winter for annual grasses; and, non-selective Glyphosate (RoundUp Pro at 1.5-2.0 percent) for all weeds in spring. Herbicide shall be applied according to the recommended application rate on the herbicide label for wildlands. Herbicide treatment shall be conducted only when weather conditions are conducive to effective uptake of the herbicide by the target species (e.g. sunny, dry with ambient temperatures at least 65 degrees Fahrenheit) and when plants are at the specified growth stage. Wind conditions should be five mph or less to minimize herbicide drift. Treated plants shall not be disturbed until the applied herbicide has had time to take effect per the manufacturer's instruction.<br><br>Dye: Non-Toxic brightly colored dye (ie Blazon or Turfmark) shall be mixed with the herbicide at no more than half the rate specified on the label. | |
| **Seeding** | Seed balls; or broadcast seeding using a small hand-held spreader to evenly broadcast the seeds. Following seeding, a rake will again be applied to lightly cover the seeds no more than ½-inch of soil. | Broadcast seeded with an 8-foot wide, pull-type broadcast seeder towing an 8-foot-wide cultipacker roller. A wheeled tractor will be used to pull the seeder. The tractor will be set at between 3 and 4 mph, and the seeder calibrated accordingly to dispense the appropriate amount of seed within each treatment plot. Seeds shall be planted at a depth of not less than ¼ inch and no greater than ½ inch. | Seed balls; or broadcast seeding using a small hand-held spreader to evenly broadcast the seeds. Following seeding, a rake will again be applied to lightly cover the seeds no more than ½-inch of soil. | Drill seeded with an 8-foot wide, range drill-type seeder with row discs before and wheels behind the seed row. A wheeled tractor will be used to pull the seeder. The tractor will be set at between 3 and 4 mph, and the seeder calibrated accordingly to dispense the appropriate amount of seed within each treatment plot. Seeds shall be planted at a depth of not less than ¼ inch and no greater than ½ inch. | | NA | Drill seeded with an 8-foot wide, range drill-type seeder with row discs before and wheels behind the seed row. A wheeled tractor will be used to pull the seeder. The tractor will be set at between 3 and 4 mph, and the seeder calibrated accordingly to dispense the appropriate amount of seed within each treatment plot. Seeds shall be planted at a depth of not less than ¼ inch and no greater than ½ inch. | Hand-seeded using a 'belly grinder' to broadcast seeds. The seeder will be calibrated and applied evenly over the test plots. Following seeding, a rake will again be applied to lightly cover the seeds no more than ½-in. |

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| **Post-Seeding Weed Management** | Prepare a post seeding management plan, based on monitoring results that might continue with hand weeding only, or spot herbicide application. | | | Prepare a post seeding management plan, based on monitoring results that might manage with hand weeding or continue with mowing and herbicide tests. | | | | |