



Cuyamaca Rancho State
Park Reforestation Project
2010-2011 Annual Report



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2010-2011 Fiscal Year Highlights

Cone Collection – August 2010 – Seed cones from the native species of Jeffrey pine and sugar pine were harvested from Cuyamaca Rancho State Park. The joint effort on the part of CAL FIRE, US Forest Service, G&B Reforestation, Inc. and California State Parks was led by Mike Puzzo of California State Parks.

Reforestation Project Manager Hired – November 2010 – California State Park's Colorado Desert District hired Lisa Gonzales-Kramer, to become the Project Manager to guide the Project under the increasing workload and to ensure that the Project meets annual restoration and verification targets.

Verification Activities Continued – January 2011 – Registered Professional Forester, Timothy Robards, PhD, and Forestry Consultant Nancy Budge met on-site with the Project Team to review the requirements of the Climate Action Reserve's Forest Project Protocol v.3.2 and developed a plan for verifying the Project per the protocol.

Planting - February 2011 – Approximately 93,000 native seedlings were planted in 10 days; 359 new acre footprint, 127 inter planted acres using a professional planting crew from California Reforestation, Inc. Planting included experimental protection measures.

Seed Germination Tests completed - March 2011 – Teri Griffis of CAL FIRE's Lewis A. Moran seed processing center reported germination rates of 92% for Jeffrey pine and 88% for sugar pine – evidence of a hearty 2010 seed cone crop.

Site Preparation / Fuels Reduction – April - June 2011 – Forty acres were prepped for the 2012 planting season using a contractor to remove dense brush with mechanical mastication equipment.

American Forests Site Tour – May 2011 – Newly hired American Forests' Chief Executive Officer, Scott Steen and Vice President of Communications and Marketing Lea Sloan visited the Project.

Third Party Verifier Selected – June 2011 – After a rigorous competitive bid process in response to a Request for Proposal (RFP), Environmental Services, Inc. was awarded the contract to provide third party verification services and began review of project documents.

This Annual Report was prepared by California Department of Parks and Recreation to summarize the activities and expenditures of the Cuyamaca Rancho State Park Reforestation Project which occurred during fiscal year 2010-2011 (July 1, 2010 through June 30, 2011).

Project Description and Goals



View of Cuyamaca Lake from Stonewall Peak prior to the 2003 Cedar Fire.

Summary: In 2003, the Cedar Fire, California's largest fire in recorded history, destroyed 95% of the mixed conifer forest in the 24,768 acre Cuyamaca Rancho State Park. The Cuyamaca Rancho State Park Reforestation Project is designed to restore the park's diverse native forest. The reforestation work consists of planting approximately 1,000,000 seedlings across 10% of the park lands in strategically located areas. Through maturation and seed dispersal these seedlings will promote the restoration of the conifer forests over time resulting in conditions favorable for critical wildlife habitat for rare and sensitive species, increased recreation values for Southern California residents and visitors, and improved air quality through carbon sequestration and storage. The project is currently undergoing third party verification to become the first reforestation project and first project on public lands to be registered at the Climate Action Reserve. Project activities are being conducted by the California Department of Parks and Recreation in partnership with the California Department of Forestry and Fire Protection (CAL FIRE).

Project Location: Cuyamaca Rancho State Park is located 40 miles east of San Diego on Highway 79 in San Diego County, California. The park is situated within the Peninsular Range of mountains with elevations that range between 3,400 feet and 6,500 feet. Vegetation in the park is a mix of grassland, Chaparral, oak woodland, mixed conifer and hardwood forests (e.g., Coulter pine, canyon live oak, black oak) and coniferous forests (e.g., sugar pine, incense cedar, Jeffrey pine, white pine). Coniferous forests

dominated the eastern and the northern aspects in the higher elevations prior to the Cedar Fire. The park averaged 440,000 total annual visitors in 2009 and 2010. The developed areas of the park include over 160 campsites, hiking, biking, and equestrian trails, the San Diego Outdoor School Camp, nine permanent and one seasonal employee residence and one historic house which is not yet open to the public.



Left: Fire wall climbing over Middle Peak during the 2003 Cedar Fire. Below right: Smaller trees act as fire ladders allowing the flames to spread to the forest canopy.

2003 Cedar Fire: In October of 2003, the Cedar Fire burned over 270,686 acres in Southern California including almost the entire Cuyamaca Rancho State Park. This was the largest recorded fire in California as measured by fire perimeter maps which have been used to document the extent of burned areas since the early 1900's. Conifer mortality in the park was extremely high due to the fire severity and extremely high temperatures which resulted in very low seed cone survival. Litter and duff layers were burned down to the mineral soil which resulted in disturbance of soil structure, nutrients and microbes. Post-fire vegetation is dominated by herbs, shrubs and re-sprouting oak species. In some of the stands surveyed post-fire, *Ceanothus palmeri* increased from 3% to 31% and the cover of annual grasses increased from 3% to 40%. Historically the California Department of Parks and Recreation has treated unscheduled wildland fires as natural disturbances and does not normally reforest other than mitigation for erosion. However, concerns in the department grew as on-the-ground surveys showed the mixed conifer forest in the park was regenerating at only a small fraction of its pre-fire density.





Cone collection occurred at Paso Picacho and Cuyamaca Peak in early September 2010.

Project Activities: In August 2007 Parks began discussing the opportunity to participate in a carbon sequestration effort as a way to support a comprehensive reforestation project in the park. Project activities started in fall of 2007 with planning, GIS mapping and site preparation by California State Parks and CAL FIRE employees for two pilot planting areas. Between 2007 and 2011, 725 total acres have been prepared and planted. Significant work is required for site preparation involving removal of thick brush by hand crews and mechanical mastication equipment. Seedlings are sourced from the CAL FIRE nurseries, the USFS nursery in Placerville, and other sources as available. In 2010, seed cones were collected in the park and sent to CAL FIRE's Lewis A. Moran Reforestation Center in Davis, CA, for germination and use in the project. The project uses 100% native species with a composition of species based on historical species surveys. The overall target mix is 65% Jeffrey pine (*Pinus jeffreyi*), 15% Coulter pine (*Pinus coulteri*), 8% sugar pine (*Pinus lambertiana*), 5% incense cedar (*Calocedrus decurrens*), and 7% white fir (*Abies concolor*). Higher percentage of Jeffrey pine has been chosen because this species has not been regenerating well on its own and is more fire and disease resistant. During 2012-2020, there will be up to nine additional phases (see chart on opposite page). This schedule may be accelerated or slowed depending on funding and other factors such as weather.

Benefits: In the absence of the reforestation activities, the *Ceanothus* vegetative cover is expected to continue to dominate the forest area for the foreseeable future. Mixed Conifer Forest is an important ecosystem for a wide range of flora and fauna. Restoring the forest habitat in the park will provide important protected areas for a wide variety of native mammal and bird species which are experiencing strong and continuous development pressure. Coniferous forest habitat is critical to forest dwelling species such as the red-breasted sapsucker, red-breasted nuthatch, and golden-crowned kinglet. Reforestation is necessary for preventing the spread of invasive weeds and reducing erosion risks, protecting watershed function, archaeological sites, botanical reserves and the recreational capacity of the park. Additional project-related opportunities are ongoing research, such as studies of seedling survival and the role of *Ceanothus* in soil restoration by the University of San Diego. San Diego State University, University of California at Riverside, and the University of California at Davis are among other institutions supporting or proposing to support restoration-related research at the park.

Carbon Offset Quantity and Accounting: The climate benefits of the proposed project come from accelerated restoration of the forested landscape. The CRSP Reforestation Project is eligible for registration with

Reforestation Phases			
	Acres Planted (not including interplanting)		Planting Complete By:
	Annual	Cumulative	
Pilot	29	29	March 2008
Phase 1	148	177	March 2009
Phase 2	189	366	March 2010
Phase 3	359	725	March 2011
Phase 4	272	997	March 2012
Phase 5	203	1,200	March 2013
Phase 6	200	1,400	March 2014
Phase 7	200	1,600	March 2015
Phase 8	200	1,800	March 2016
Phase 9	200	2,000	March 2017
Phase 10	200	2,200	March 2018
Phase 11	200	2,400	March 2019
Phase 12	130	2,530	March 2020

The reforestation project planting activities will continue through 2020.

the Climate Action Reserve because it occurs on land that has undergone a significant fire disturbance. The carbon sequestration resulting from reforestation is considered “additional” because, in the absence of the project, shade intolerant brush and exotic annuals would be expected to persist for 50 years or more. The project incorporates systematic monitoring, reporting and verification to assess progress towards the park’s restoration goals, to meet the requirements of the Climate Action Reserve’s protocol and to ensure that credited reductions are sustained for 100 years. Initial third party verification for project eligibility and impacts of site preparation activities is currently ongoing and expected to be complete in 2012. The climate benefits include the ability to reduce atmospheric carbon dioxide at a rate of approximately 1.2 metric tonnes per acre per year and the potential storage of 120 metric tonnes of carbon dioxide equivalent per acre.

Dense thickets of *Ceanothus palmeri* now grow where forest canopy existed prior to the fire.



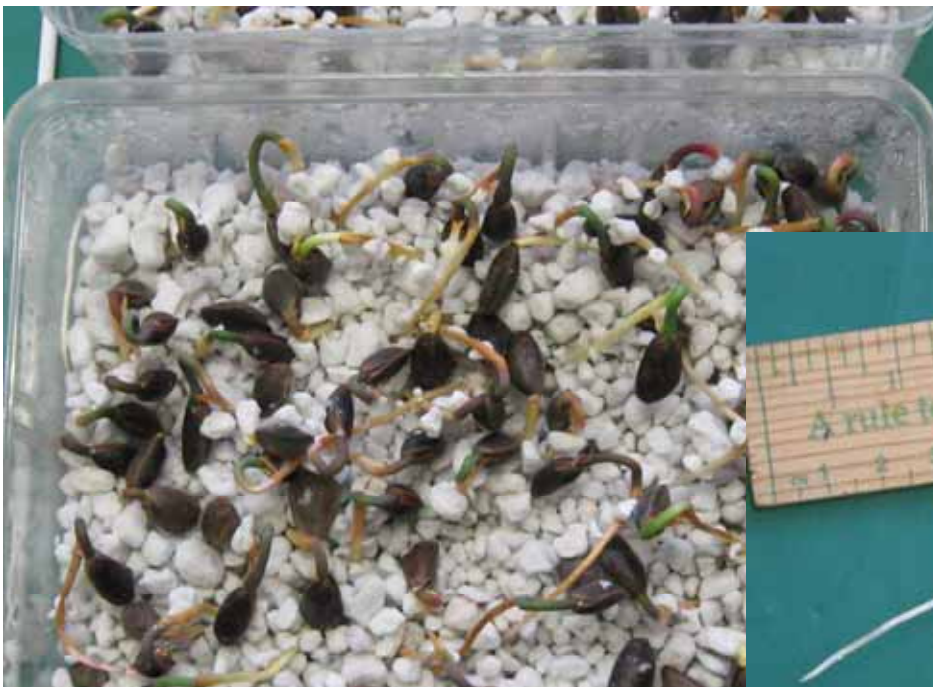
Project Activities - FY 2010

The project has a sequence of tasks that must be completed before planting can take place during February and March of each year. These months provide the weather conditions which are most favorable for seedling establishment and survival in Southern California's arid mountainous region. The Project activities are listed below and described more fully in the following sections:

- Seed Collection
- Site Selection
- Botanical and Archaeological Review
- Seedling Procurement
- Site Preparation
- Seedling Delivery and Storage
- Planting
- Seedling Protection
- Monitoring
- Research—Nitrogen Fixation
- Verification

Seed Collection

During the fall of 2010, 48 bushels of Jeffrey pine and 30 bushels of sugar pine seed cones were collected by CAL FIRE inmate crews and G&B Reforestation, Inc. Seed cones were collected in the area of surviving canopy on the east side of Cuyamaca Peak. Species and numbers of cones collected each year will depend on the previous year's cone crop as cones require two years to mature. Use of these seed cones from the Park insures that the surviving genetic diversity in the Cuyamaca mixed conifer forest is preserved. Collected seed was transported to the Lewis A. Moran Reforestation Center in Davis where it is kept in cold storage until needed. Seeds remain viable for several years and are not necessarily used in the first year following harvest. Germination trials showed that 92% of the Jeffrey pine and 88% of the sugar pine seeds collected in 2010 were viable.



Germination trials were conducted at CAL FIRE's Lewis A. Moran Reforestation Center in Davis, California.



Site Selection

During FY 2010, 778 acres were identified as possible planting areas. Planting sites are selected two to four years prior to planting. Criteria for selection of planting sites include presence of mixed conifer or pine-oak woodland prior to the 2003 fire, elevation, aspect and accessibility. After initial selection, the site is surveyed by an Environmental Scientist in the field to confirm the sites' suitability and to determine the planting area boundaries.

Botanical and Archaeological Review

During FY 2010, 178 acres were eliminated as potential planting areas due to the presence of sensitive natural or cultural resources. Typically, during May and June of the year prior to planting, nominated planting



***Brodiaea orcuttii*, found in the park, is a federal species of concern. All potential planting sites are surveyed and planting polygon boundaries are adjusted to avoid disturbing sensitive botanical and cultural resources.**



Kumeyaay Indian projectile points and other historic cultural resources are found throughout the park.

areas are surveyed by a park botanist to determine the presence of rare or sensitive plants that could be disturbed by project activities. Areas with sensitive plants are removed from the planting polygon. During the summer prior to planting, the nominated planting areas are surveyed by a park archaeologist to determine if there are archaeological resources that could be disturbed by project activities.

The locations with sensitive archaeological resources are removed from the planting polygon. Also, in areas where the soil surface is obscured by heavy brush, archaeologists will be on-site during plot preparation activities (hand or machine) to monitor, detect and protect archaeological resources that may be uncovered.

Seedling Procurement

One to two years prior to planting, an order is placed for seedlings. The species mix depends on the elevation and aspect of the nominated planting area(s) and the desired planting density. The seeds are planted in the nursery in January and grown for a period of one to two years. In December of 2010 a seedling order for 85,000 seedlings (to be planted in 2012) was made to the US Forest Service Placerville Nursery. The order included 60,000 Jeffrey pine, 10,000 Coulter pine, 10,000 white fir and 5,000 sugar pine.



***Ceanothus palmeri* grows 12 to 14 feet high in many locations throughout the park.**



Forty acres were masticated along Hwy 79 to prepare the site for the FY 2011 planting season. A subsequent prescribed burn reduced debris and helped to recreate the ecological conditions that normally exist following a wildfire of less intensity.

Site Preparation

Under the conditions of a less intense fire, the surviving seed stock sprouts, allow some of the conifer seedlings to become established before being shaded out by surrounding vegetation. However, very little seed stock in Cuyamaca Ranch State Park survived the Cedar Fire. Much of the area is now covered with dead woody debris and/or thick stands of chaparral that have grown up in areas previously covered in mixed conifer forest and pine/oak woodland. Before these areas can be planted, hazardous standing dead trees must be felled and chaparral brush is cut back so that planting crews can have access to the soil surface. This work is completed by hand crews and/or mechanical equipment. During FY

2010, approximately 40 acres of brush and debris were treated with mechanical masticators adjacent to Highway 79 near Paso Picacho (see map p. 16). The site will be planted during FY 2011. This site preparation work was paid for by a CAL FIRE grant for hazardous fuel reduction. The area was treated with prescribed fire following the mechanical treatment to remove excess debris, and recreate the ecological conditions that would normally exist following a wildfire of less intensity. *Ceanothus palmeri* re-sprouts from the root structure which is left intact during standard site preparation protocol. Not all planting areas require site preparation. In FY 2010, all seedlings were planted in non-site prepped areas.

Delivery and Storage of Seedlings

On January 21, 2011, 92,730 seedlings, which had been ordered in 2009 for the 2011 planting season, were delivered. The viability of seed and survival of seedlings while in culture varies from year to year so more seedlings were grown than ordered. We received 66,470 Jeffrey pine (4,470 more than ordered), 20,170 Coulter pine (3,170 more than ordered) and 6,090 sugar pine (4,590 more than ordered). The seedlings were stored in a rented refrigerated trailer at Paso Picacho until the day they were planted. All seedlings were placed in the ground within 14 days of receipt.



The seedlings are stored in a refrigerated trailer prior to being planted. Seedling protection measures are staged on-site as well.

Planting

Planting began on February 1, 2011. For the second year California Reforestation, Inc., was awarded the planting contract. Approximately 92,730 seedlings were planted in ten working days. A total of 486 acres were planted in upper Green Valley, North Stonewall, West Mesa, Middle Peak and East Mesa (see map p. 17).

Seedling Protection

In order to improve first year seedling survival rates, two protective treatments were implemented in FY 2010. One treatment was the use of mulch mats by EcoCover USA. These are 12"x 12" mats of compressed, recycled paper which are installed around the planted seedlings and held in place by biodegradable pins, or rocks and soil. The mats are designed to increase soil moisture by discouraging the growth of competing annual grasses adjacent to the seedlings, and by acting as a mulch to reduce the loss of moisture through evaporation from the soil surface. The second protective treatment was the use of shade cards. These are 6"x 8" squares of black mesh material held by a wire frame. They are installed vertical to the ground, on the south side of the seedling to reduce exposure to direct sunlight during the hottest part of the day.

To evaluate the efficacy of each treatment type, use of treatments were implemented in varying combinations at several sites. For every four trees planted one was planted with an EcoCover, one with a shade card, one with the combination of an EcoCover and shade card, and one as a control with no treatment. In FY 2010, approximately 80,000 seedlings planted in Upper Green Valley, West Mesa, and East Mesa were part of this trial.



The professional planting crew planted approximately 10,000 seedlings per day.



Three combinations of seedling protection measures were installed on seedlings planted in FY 2010. This seedling is protected with an EcoCover mulch mat to reduce competition from surrounding vegetation and retain soil moisture. The mesh shade card protects the seedling from the intense summer sun.

Monitoring

In the spring of 2011, the plantings along the Azalea Springs Fire Road were surveyed by a Conservation Biology class from University of San Diego. The purpose of the survey was to compare mortality rates in first year plantings (planted in 2010) to mortality rates in cohorts planted in 2008 and 2009. The survey found that seedlings in their first year of growth had higher rates of mortality than trees in their second or third years. This suggests that the most effective way to increase over-all survival would be to protect seedlings in their first year of growth. Each year the results of these monitoring surveys will provide valuable feedback for the subsequent planting season, allowing the team to employ adaptive management practices as needed.

Nitrogen Fixation Research

During the summer of 2010 a contract was made with two researchers at the University of San Diego to investigate the role of shrubs in the genus *Ceanothus* in the process of nitrogen fixation following fire. Some species in that genus are known to have symbiotic relationships with diazotrophs, soil microorganisms that are capable of converting atmospheric nitrogen to forms that are usable by plants. The study is to assess the role that *Ceanothus* plays in this process at Cuyamaca Rancho State Park. A project study plan was submitted and approved during the fall of 2010 and field work began during the winter of 2010/11.

Verification:

During fiscal year 2010-2011, the CRSP Reforestation Project began the process of third party verification required for registration of forest carbon projects with the Climate Action Reserve (www.climateactionreserve.org). The purpose of verification is to determine if the project has met all the eligibility criteria, followed the operating protocols, and provided complete and accurate reporting of activities. During fiscal year 2010-2011, project documentation was reviewed and prepared for submittal to the verifier. This work included finalizing the Carbon Inventory Methodology and collecting measurements of on-site carbon (live trees, dead standing trees, dead down trees, and brush) prior to site preparation work as shown in the table below. In addition the boundaries for the initial Project Area were finalized (see Project Area Boundaries map p. 15) and the Project Design Document was completed. The contract for a third party verifier was awarded to Environmental Services Inc. in May, 2011 and their verification work continued into fiscal year 2011-2012.

Estimates of Current Forest Carbon Pool Components			
Based on Pre-Treatment Cruised Plots Through May, 2011			
Pool	Carbon (tonnes/acre)	CO₂e (tonnes/acre)	Percentage
Standing Live	1.146	4.205	8.1%
Standing Dead	10.188	37.388	71.8%
Lying Dead	2.253	8.269	15.9%
Shrub/Forb	0.607	2.227	4.3%
Total	14.193	52.090	100.0%

Carbon and CO₂e totals are off due to rounding.



Seedlings growing in the Azalea Springs area were monitored by a Conservation Biology class from the University of San Diego during the spring of 2011.

Estimates of current carbon pool components calculated from data collected on 69 plots prior to any site preparation or

Project Expenditures and Funding

CRSP Reforestation Project expenditures for Fiscal Year 2010/2011 were \$310,185 and totaled \$1,402,771 during the first four years of operations. Project expenditures are shown by category in the chart below.

4-YEAR - EXPENDITURES - Cash Basis					
Spending Category	FY 07/08	FY 08/09	FY 09/10	FY 10/11	4-YR TOTAL
Mapping & Planning	7,778	15,176	21,531	17,505	61,991
Archaeology	2,663	6,219	5,127	9,280	23,289
Forest Inventory and Survey Work	0	4,769	3,808	8,967	17,543
Site Preparation	215,445	122,725	174,951	75,828	588,949
Seedlings *	3,600	42,000	18,608	0	64,208
Planting & Interplanting	54,760	118,476	86,936	100,258	360,431
Seedling Protection/ Watering	14,717	34,914	17,258	24,479	91,367
Acquiring Seed Stock	0	0	0	10,485	10,485
CAR Registration and Verification Fees	0	500	1,000	30,003	31,503
Follow-Up Vegetation Treatment	0	0	0	0	0
10-yr Thinning & Fuels Treatment	0	0	0	0	0
Research	4,083	40,428	0	0	44,511
Project Management & Public Outreach	26,469	32,341	16,304	33,379	108,492
Totals	329,515	417,550	345,522	310,185	1,402,771
* The invoice for the seedlings planted in FY 10/11 was received and paid in FY 11/12					

Expenditures are reported in the fiscal year the expenses are paid. The largest category of spending, Site Preparation, is expected to continue to significantly impact costs in the future.



Eight-plus years of *Ceanothus* growth exists in areas which were mixed conifer forest habitat prior to the fire.

Over 75% of funding for expenses in FY 2010-2011 came to the project in the form of private donations from a variety of sources. This high percentage of private funding contrasts with support in the first three project years which came largely from the on-the-ground activities of the California Department of Forestry and Fire Protection (CAL FIRE). The growing percentage of private funding has been provided by tree-planting campaigns as well as agreements for carbon credits. California State Parks continues to receive commitments for additional donations and private funding is expected to be the largest source of funding for the project over the next ten to fifteen years.

4-Year - Funding Applied					
Funding Source	FY 07/08	FY 08/09	FY 09/10	FY 10/11	4-YR TOTAL
CAL FIRE	254,922	239,120	168,921	49,792	712,755
California State Parks	74,593	130,513	13,581	19,477	238,163
Private Donations	0	47,917	163,020	240,916	451,853
Totals	329,515	417,550	345,522	310,185	1,402,771

Project Maps

Project Area Boundaries (p. 15): Potential planting areas for the project will be selected from the 5,664 acres which were identified in FY 2010. Characteristics such as previous mixed conifer forest habitat, known natural or cultural resources, slope, aspect and accessibility are among the many factors considered when selecting planting sites.

2010-2011 Fiscal Year Surveys (p. 16): Surveys for cultural, botanical and other resources are conducted on every potential planting site prior to initiating any site-preparation or planting activity.

2010-2011 Fiscal Year Pre-Treatment (p. 17): Pre-treatment or site preparation is sometimes conducted in order to “set the clock back” to the time of the fire. As indicated on the map, 30 acres were mechanically masticated and 40 acres were burned in FY 2010 in preparation for planting in 2011.

2010-2011 Fiscal Year Planting (p. 18): Planting crews planted approximately 92,730 Jeffery pine, sugar pine and Coulter pine seedlings on 465 acres this year.


Project Area Boundaries Cuyamaca Rancho State Park California State Parks


Middle Peak

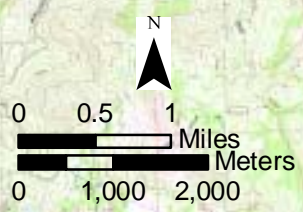
Cuyamaca Peak

West Mesa

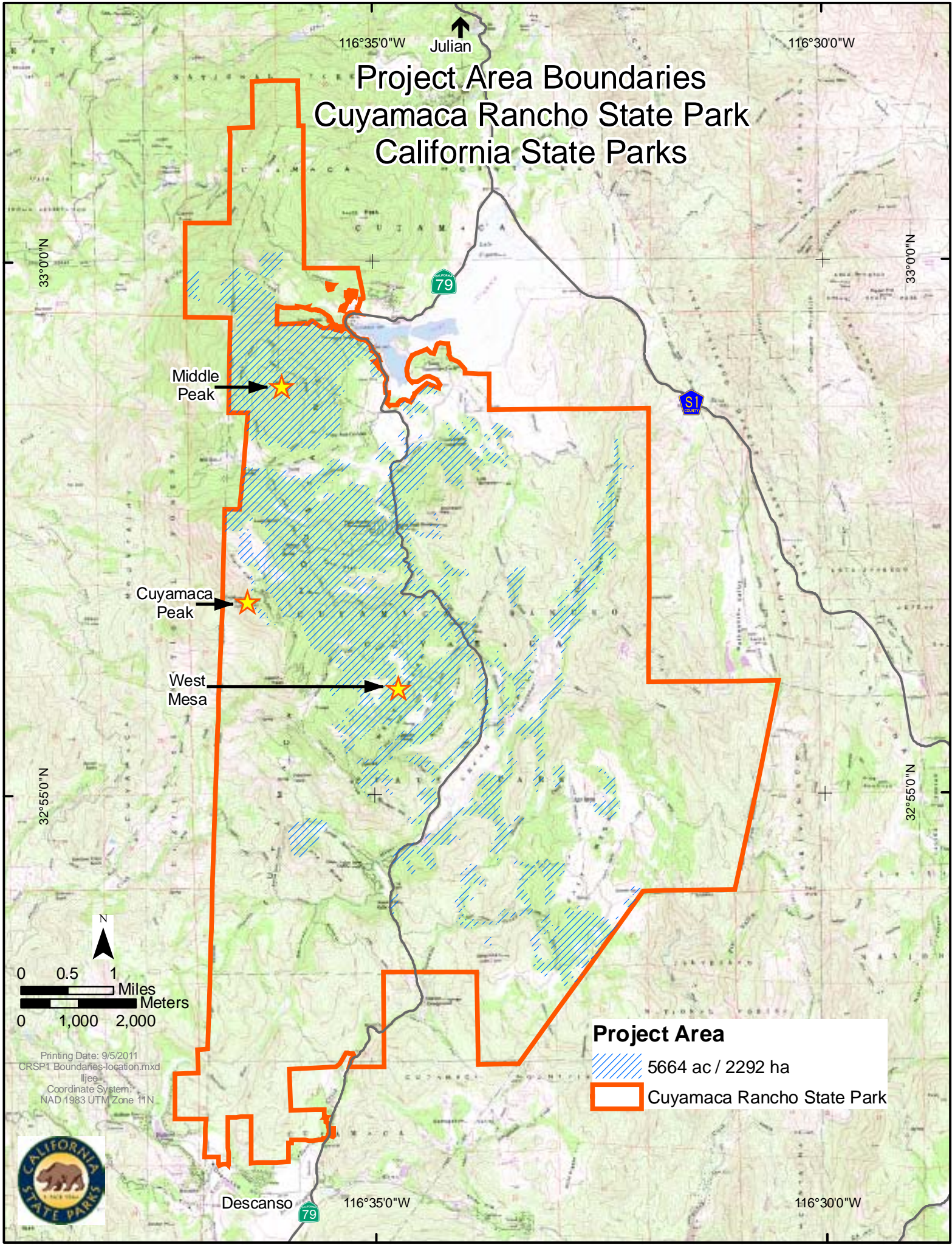
Project Area

 5664 ac / 2292 ha

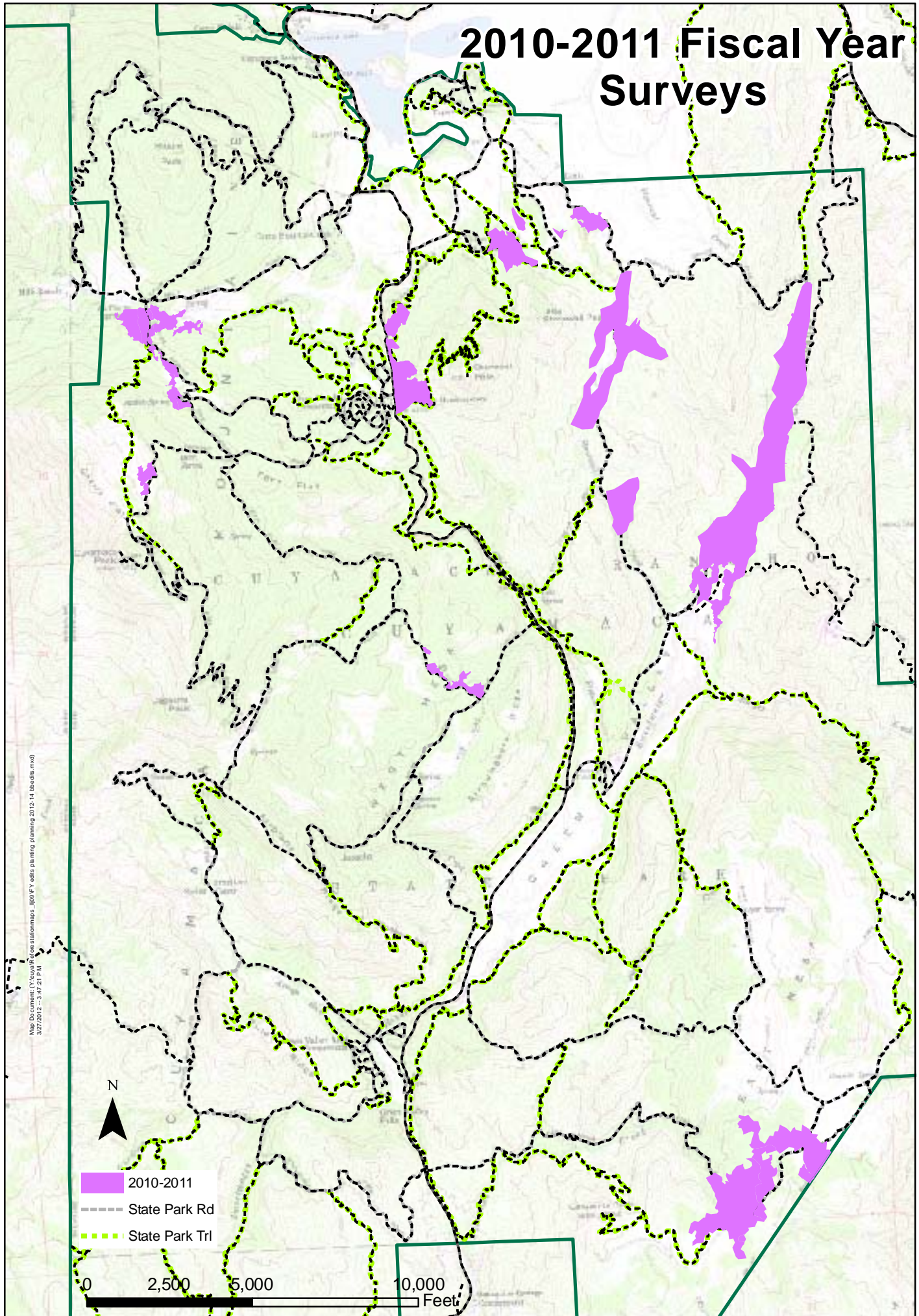
 Cuyamaca Rancho State Park



Printing Date: 9/5/2011
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Coordinate System:
NAD 1983 UTM Zone 11N

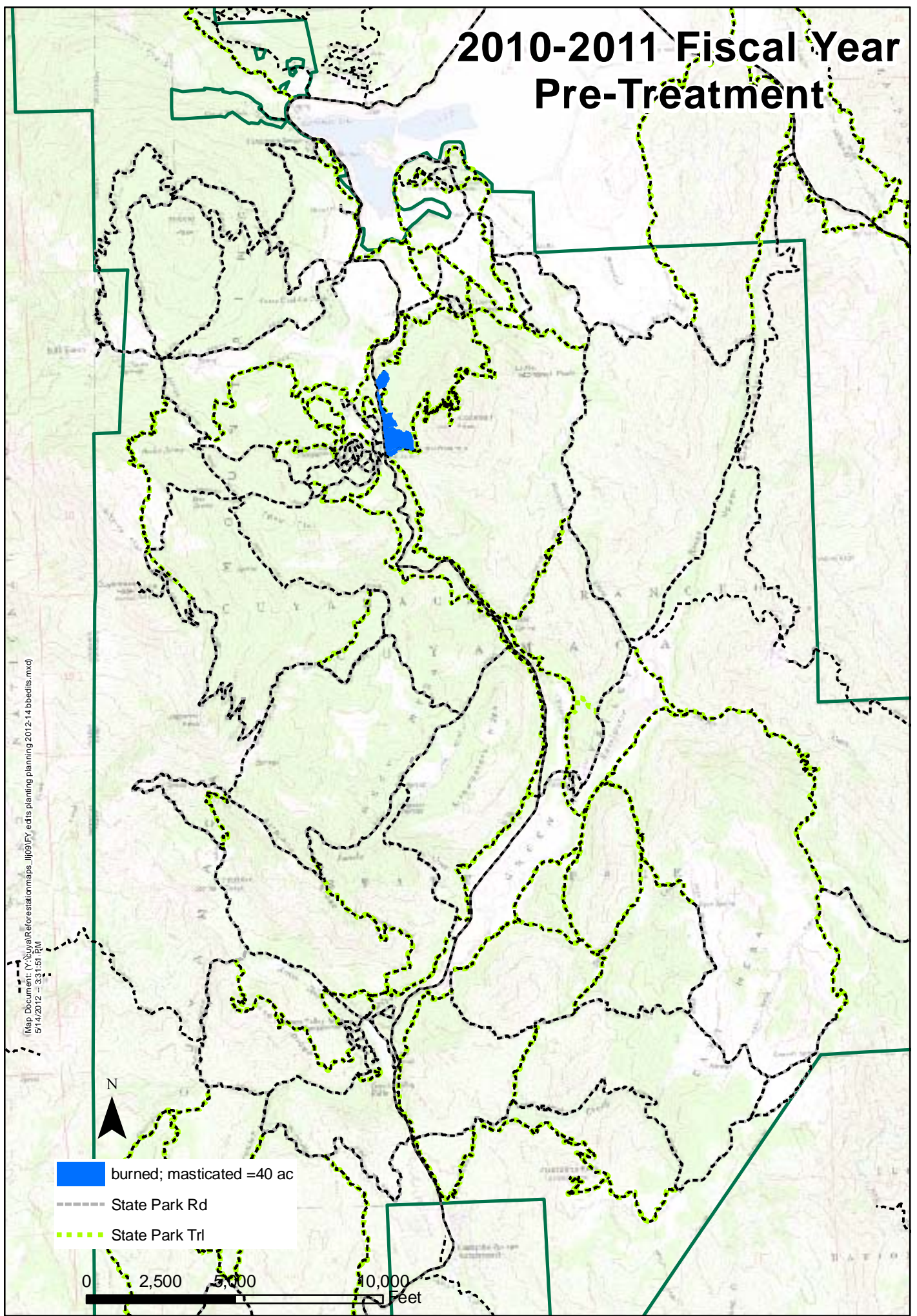


2010-2011 Fiscal Year Surveys

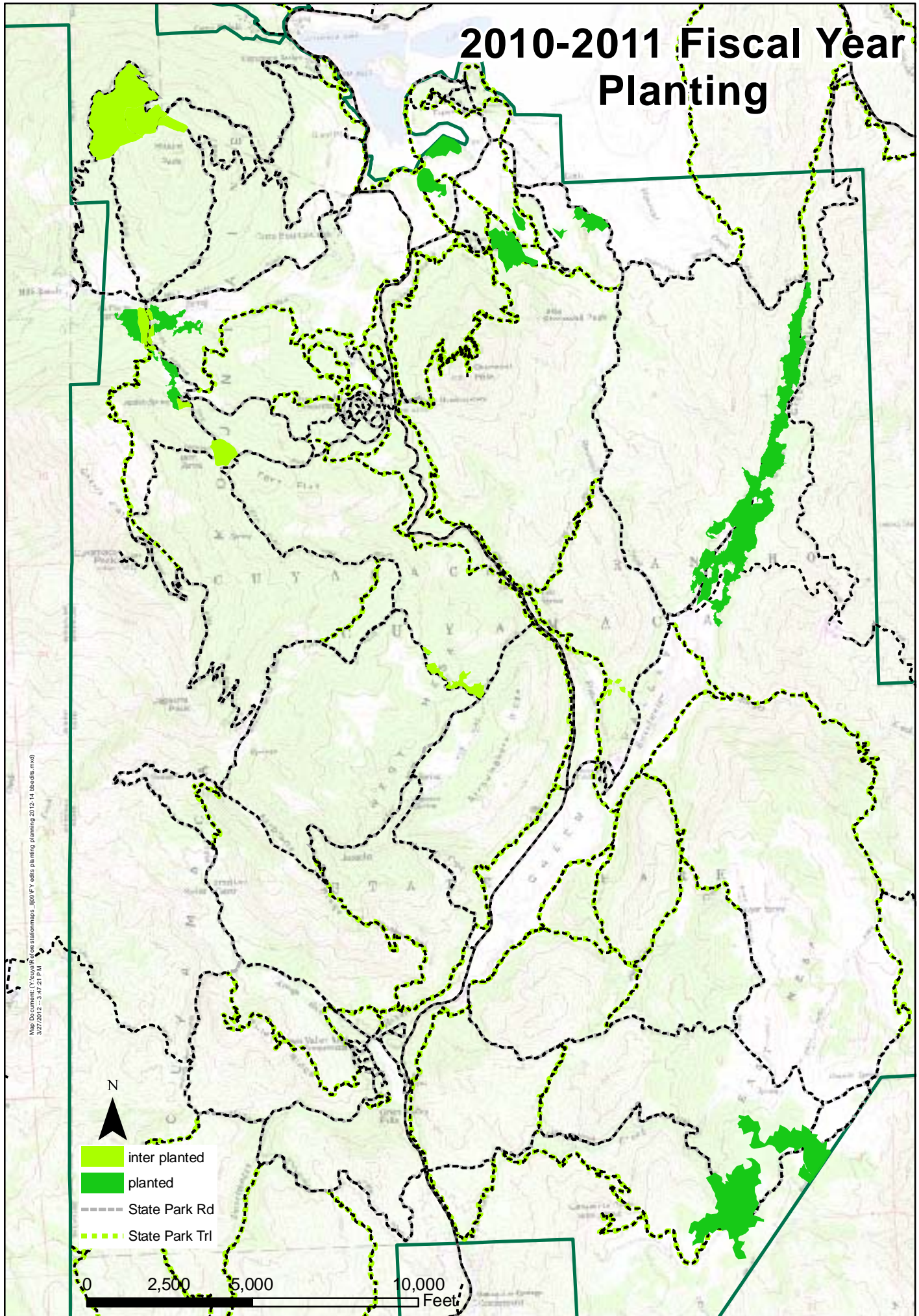


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2010-2011 Fiscal Year Pre-Treatment



2010-2011 Fiscal Year Planting



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For questions or comments contact
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