

June 17, 2017

Mr. Driz Cook
High Trails Outdoor Science School
P.O. Box 2640
Big Bear City, CA 92314

Subject: Results of the Arborist Assessment for the High Trails Outdoor School Project in the Angelus Oaks area, San Bernardino County, California

Dear Mr. Cook:

FirstCarbon Solutions (FCS) is pleased to provide you with the results of the arborist assessment conducted for the High Trails Outdoor Science School project site located at 'O' Radford Ranch Road, in the Angelus Oaks area of San Bernardino County, California. This report summarizes information on 141 individual trees and was completed by an International Society of Arboriculture (ISA) certified arborist.

SURVEY METHODOLOGY

Associate Biologist Brenda Bennett (ISA #WE-10776A) conducted the arborist assessment on May 8, 2017. Survey data including tree species, tree diameter at breast height (DBH; 4.5 feet), and approximate tree height were recorded for each tree within the proposed project development area. Individual tree locations were recorded using a Geographic Information System (GIS) and assigned unique numbers. Note that this level of detail is not displayed on figures, but is available if future impact studies require it. Several representative photos were taken throughout the proposed project development area (Appendix A).

SITE AND PROJECT DESCRIPTION

The approximately 40-acre project site is located near the community of Seven Oaks and Barton Flats in the San Bernardino National Forest, north of State Route 38 (SR-38), on the western slopes of Sugar Loaf Mountain (Exhibits 1 & 2). The project site is nearly completely bound by undeveloped land owned by the United States Forest Service (USFS) with the exception of undeveloped private land to the northwest. Elevation on-site ranges from 5,520 feet above mean sea level (AMSL) in the northwest corner to 5,322 AMSL in the Santa Ana River in the southwest corner. The project site contains several small hills and generally slopes moderately from north to south. The parcel is traversed by Radford Camp Road, which winds north to south on the western half. The property is generally undeveloped, supporting primarily oak/coniferous woodland and big sagebrush scrub vegetation communities (Exhibit 3). An expansion tank for a private water well is located on a small concrete pad in the center of the site. The eastern edge of the site contains a dirt access road and gate. The upper Santa Ana River flows through the southwest corner and to the south of the property.

The project proposes to develop approximately 2.55 acres of big sagebrush scrub and oak/coniferous forest in the southeast corner of the 40-acre property as an outdoor science school. The proposed development would include a main lodge, seven separate housing buildings, and a parking lot along with other paved surfaces (Exhibit 4).

The proposed project development area contains two land cover types: big sagebrush scrub and mixed oak/coniferous forest. These vegetation communities are discussed below in more detail.

Big Sagebrush Scrub

Big sagebrush scrub is characterized by mostly soft-woody shrubs, 0.5 to 2.0 meters tall, and is dominated by big sagebrush (*Artemisia tridentata*). Dominant species found within this habitat on-site include big sagebrush, rubber rabbitbrush (*Ericamaria nauseosa*), tarragon (*Artemisia dracunculus*), shiny-leaf yerba santa (*Eriodictyon trichocalyx*), and cheat grass (*Bromus tectorum*). Other species found scattered within this habitat included manzanita (*Arctostaphylos glandulosa*), wild rye (*Elymus* spp.), and chaparral whitethorn (*Ceanothus leucodermis*). This habitat was found between tree openings and within the understory of the mixed oak/coniferous forest.

Mixed Oak/Coniferous Forest

Mixed oak/coniferous forest is a diverse community dominated by oak and conifer species. The tree species found within the proposed project development area included yellow pine (*Pinus jeffreyi*), California black oak (*Quercus kelloggii*), interior live oak (*Quercus wislizeni*), and canyon live oak (*Quercus chrysolepis*). Tree cover was mostly open with some dense patches of oaks. The trees varied in height, but maximum heights were generally 40 feet for oaks and 60 feet for pines. The understory of this habitat type was dominated by big sagebrush scrub.

SURVEY RESULTS

The project site falls within a location of the San Bernardino National Forest where the ranges of yellow pine (*Pinus jeffreyi*) and ponderosa pine (*Pinus ponderosa*) are known to overlap (USGS 2015). It is likely that the stands of yellow pine within the project area contain individuals that are actually ponderosa pine. Due to the similarities between the two species and the amount of time it would take to identify each pine, all pine trees in the area will be referred to as yellow pine for the purposes of this report.

The arborist assessment took place within mixed oak/coniferous forest, bordered by big sagebrush scrub. Data were recorded for 141 individual trees (Exhibit 5). Species observed within the impact area were California incense cedar (*Calocedrus decurrens*), Sierra juniper (*Juniperus grandis*), yellow pine, canyon live oak, California black oak, and interior live oak. Table 1 provides tree species and size class data for trees expected to be impacted through removal. Complete assessment data can be found in Appendix B.

Table 1: Summary of Impacted Tree Data by Size and Species

Scientific Name Common Name	Approximate Height (feet)			DBH (inches)			Total Individuals
	<30	30-60	>60	<20	20-40	>40	
<i>Calocedrus decurrens</i> California incense cedar	—	—	—	—	—	—	—
<i>Juniperus grandis</i> Sierra juniper	—	—	—	—	—	—	—
<i>Pinus jeffreyi</i> Yellow pine	5	9	1	12	3	—	15
<i>Quercus chrysolepis</i> Canyon live oak	6	3	—	3	6	—	9
<i>Quercus kelloggii</i> California black oak	—	—	—	—	—	—	—
<i>Quercus wislizenii</i> Interior live oak	—	—	—	—	—	—	—
Grand Total of Impacted Trees							24

In 2015, a site forest assessment of the site had been performed and resulted in a recommendation to thin smaller oak shrubs within the property for fire management purposes (Cocking 2015). This thinning appears to have been implemented at the site; no live oaks in a shrub-form were documented during the site survey. It should also be noted prior to site impact, many of the large yellow pines were observed to have top dieback; the cause of the dieback is unknown, but may be due to insect infestation.

DISCUSSION AND RECOMMENDATIONS

The site supports 141 trees within the project impact area. Per the current project design, 24 trees within the proposed project development will be directly impacted through removal. If a more precise impact analysis is required before or after development, data collected during the site visit can be used to inform updated impact assessments.

To retain the value of the mixed oak/coniferous forest, the following is recommended (ISA 2011):

- Avoid damage during construction by erecting barriers around existing trees to be retained. Fencing should be placed one foot from the trunk for each inch of trunk diameter.
- Limit access to construction crews, allowing only one route in and out of the project area.

- Intentions to protect the trees should be communicated and written into the construction specifications.

First Carbon Solutions (FCS) appreciates the opportunity to assist you on this project. If we can be of any further assistance, or if you have any questions concerning this letter report, please contact me at (714) 508-4100 or via email at kboydstun@fcs-intl.com.

Sincerely,



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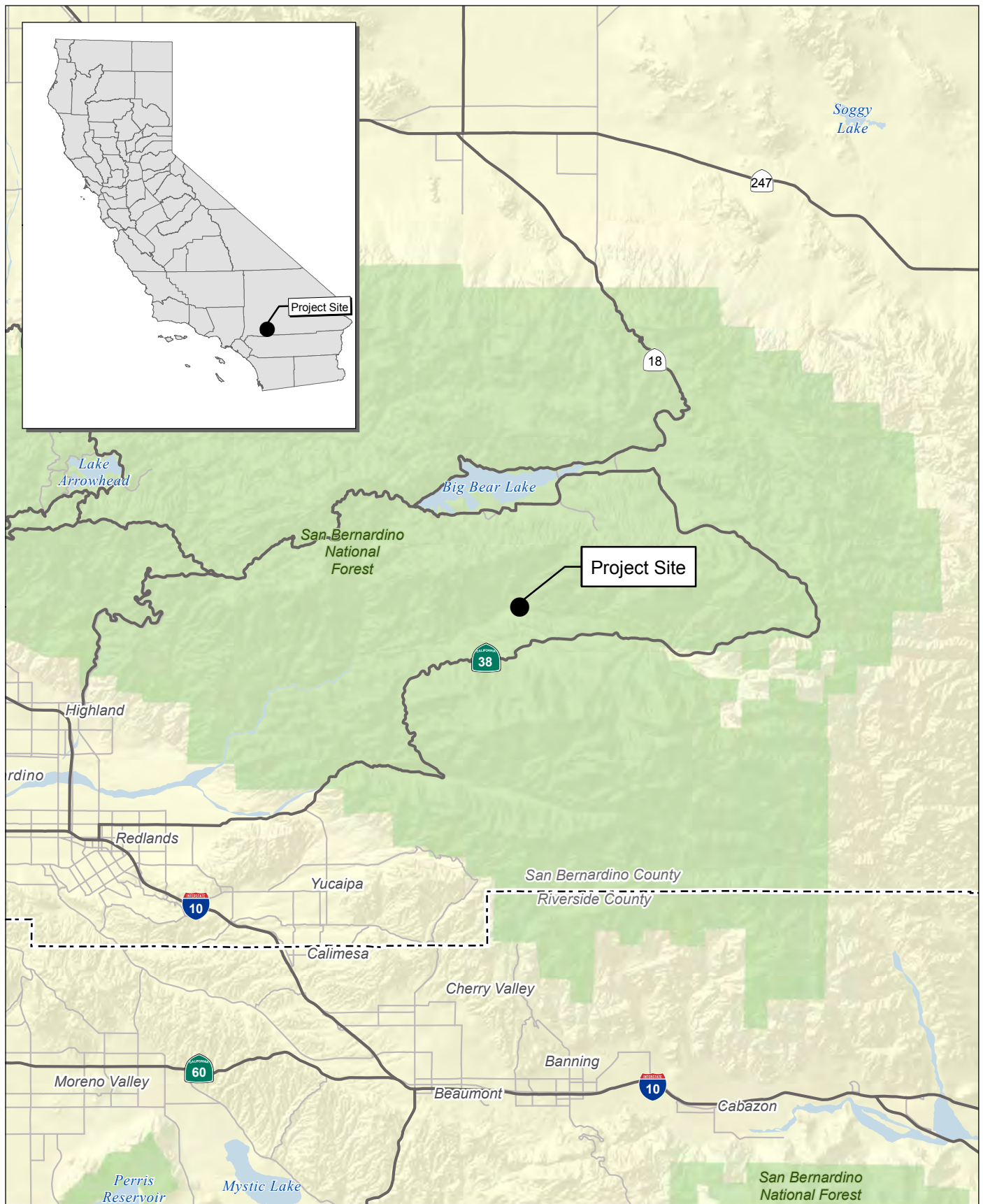
Enc: Exhibit 1: Regional Location Map
 Exhibit 2: Local Vicinity Map
 Exhibit 3: Vegetation Communities
 Exhibit 4: Site Plan 6/5/2017
 Exhibit 5: Tree Locations
 Appendix A: Site Photographs
 Appendix B: Table

References

Cocking, Matthew, 2015. *Cook Property Forestry Assessment*, 9 p.

International Society of Arboriculture (ISA), 2011. *Avoiding Tree Damage During Construction*.
[<http://www.treesaregood.com/portals/0/docs/treecare/AvoidingTreeDamage.pdf>]

USGS, 2015. *Digital Representations of Tree Species Range Maps from "Atlas of United States Trees" by Elbert L. Little Jr. (and other publications); Pinus jeffreyi and Pinus ponderosa*.
[<https://esp.cr.usgs.gov/data/little/>]



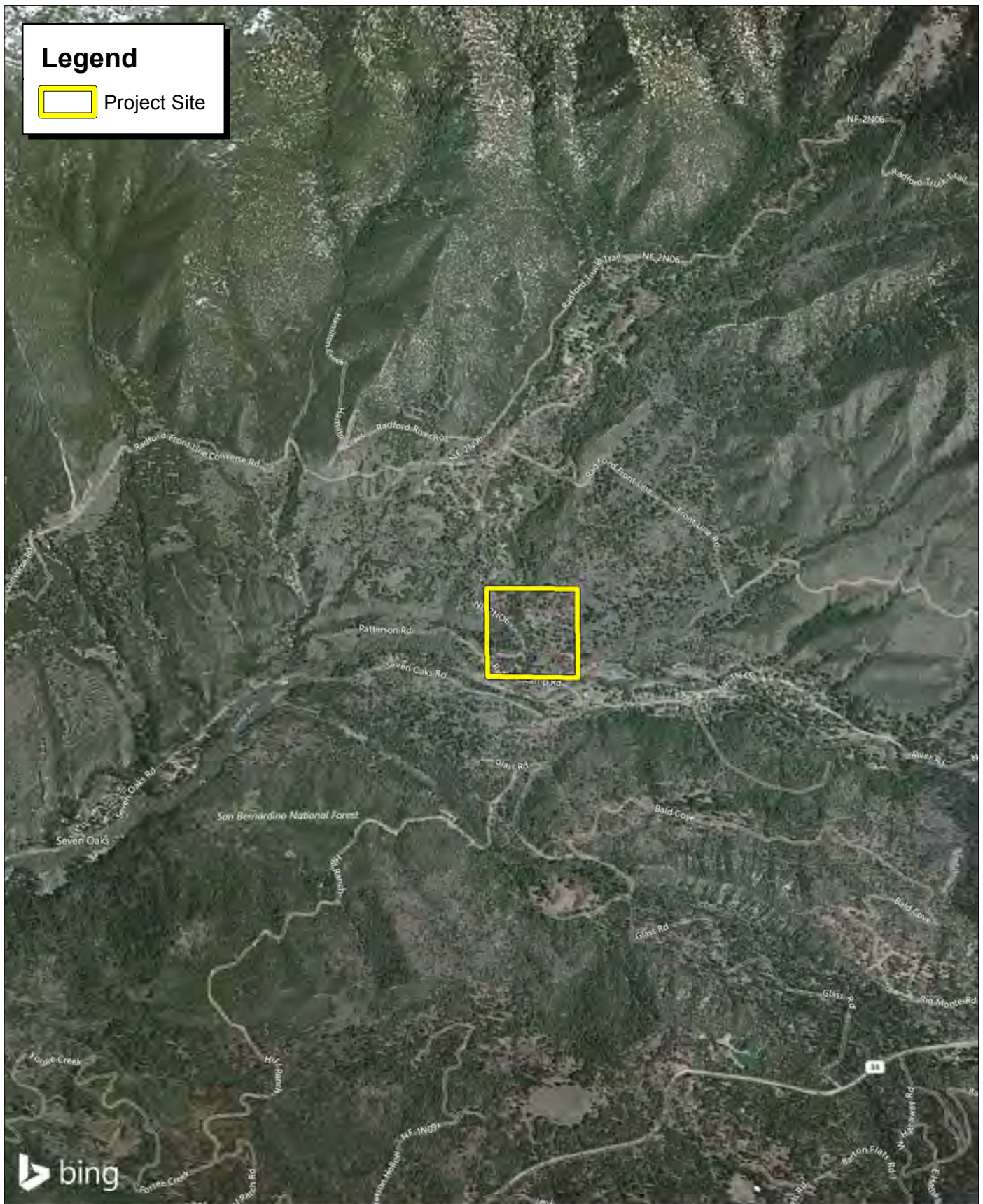
Source: Census 2000 Data, The CaSIL, FCS GIS 2016.

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Exhibit 1 Regional Location Map

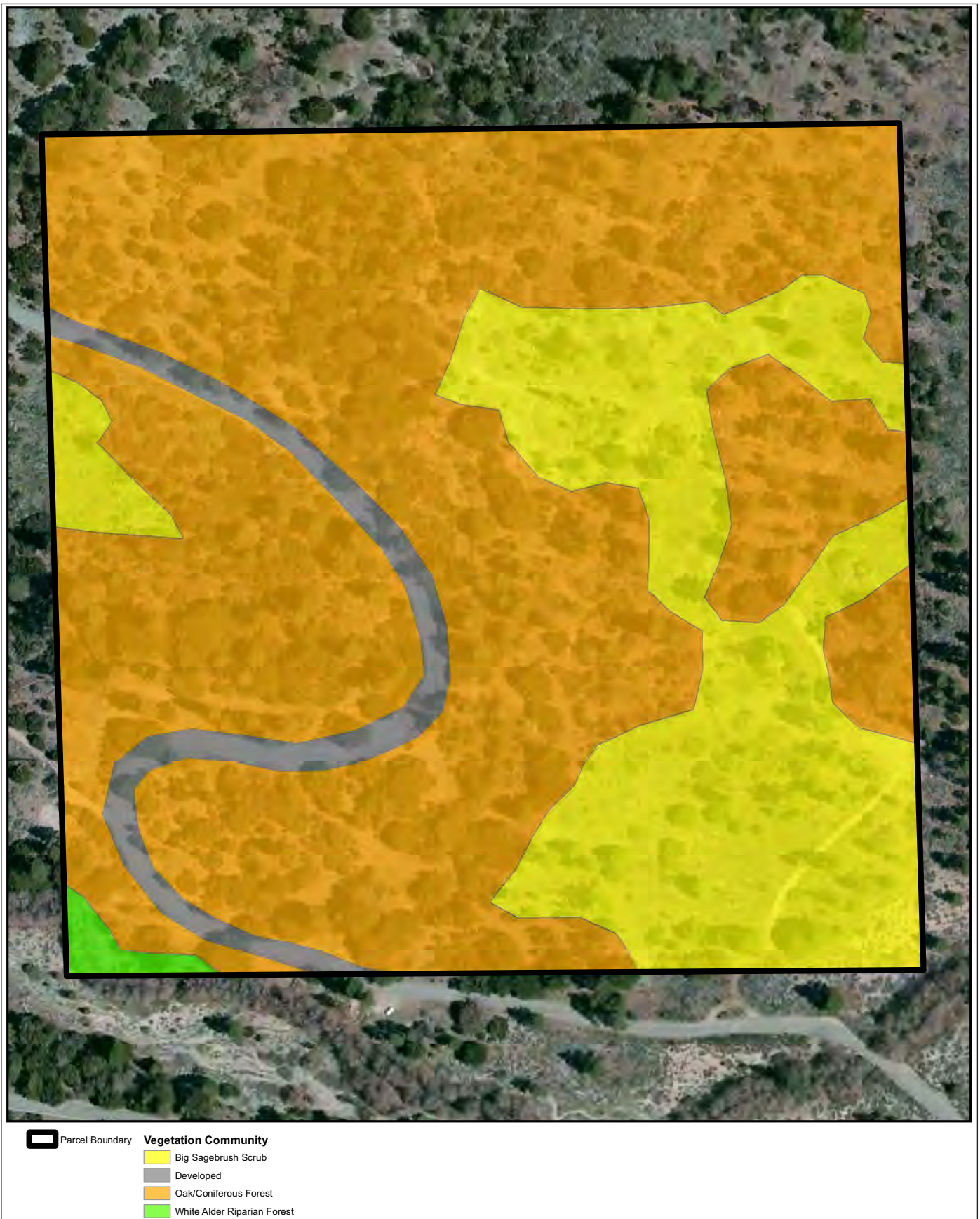


Source: Bing Imagery, 2015

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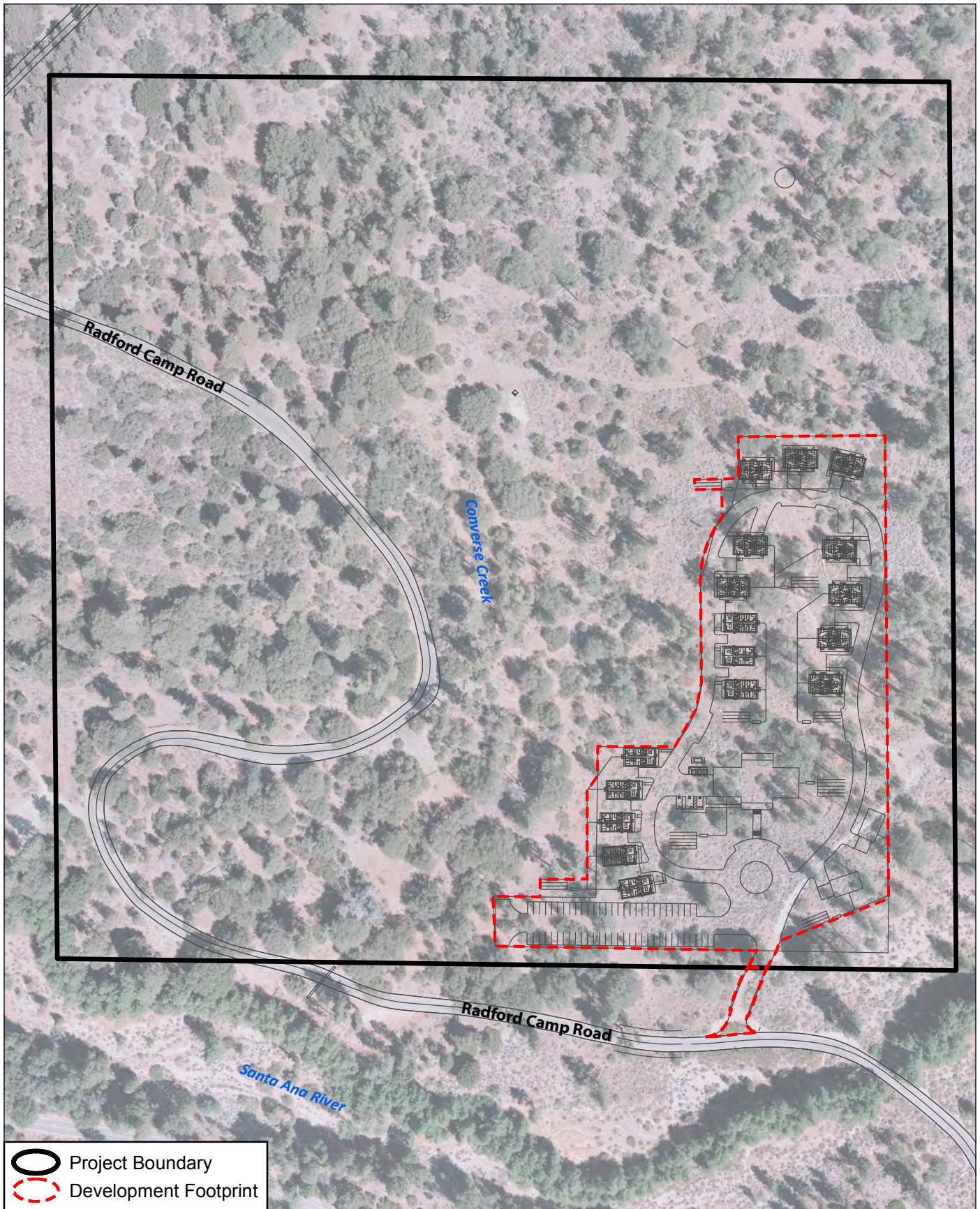
Source: Borchers Environmental Management, 2016

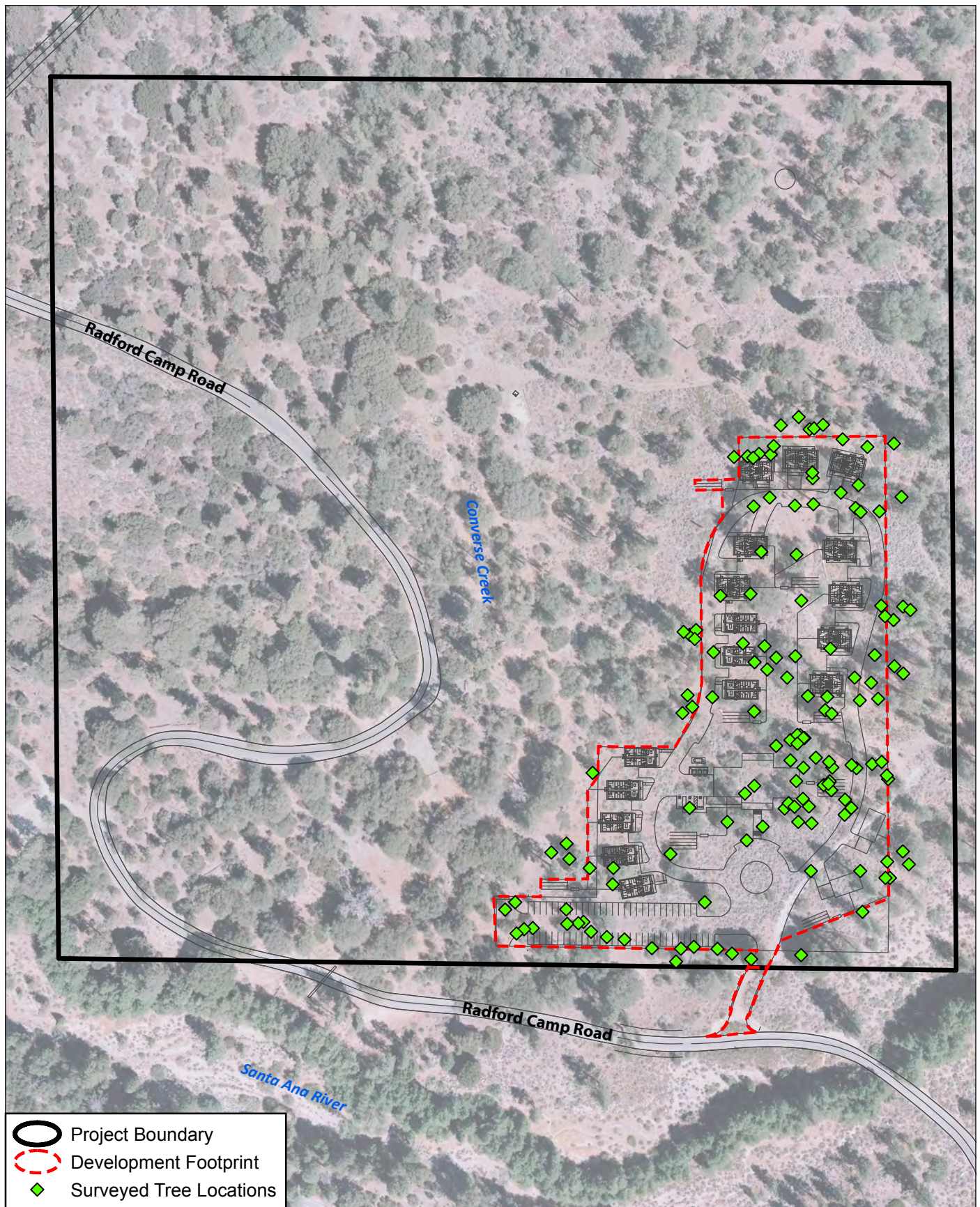
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Exhibit 3 Vegetation Communities







Photograph 1: View of the proposed project development area, looking south.



Photograph 2: California black oak behind a stand of yellow pine.



Photograph 3: Interior live oak thinning has occurred within the project development area for fire management purposes.



Photograph 4: Canyon live oak in foreground, yellow pine in background.



Photograph 5: Shrub-form interior live oak in background, results of thinning foreground.



Photograph 6: Yellow pine with dieback on top was observed throughout the impact zone.

Table 1: Arborist Assessment Data

Scientific Name	Tree ID#	Height (feet)	DBH (inches)	Tree Impact Expected
<i>Pinus jeffreyi</i>	1	90	55	No
<i>Pinus jeffreyi</i>	2	35	11	No
<i>Pinus jeffreyi</i>	3	55	30	No
<i>Juniperus grandis</i>	4	40	28	No
<i>Quercus wislizenii</i>	5	30	10	No
<i>Quercus wislizenii</i>	6	30	18	No
<i>Pinus jeffreyi</i>	7	55	27	No
<i>Pinus jeffreyi</i>	8	65	38	No
<i>Pinus jeffreyi</i>	9	20	9	No
<i>Pinus jeffreyi</i>	10	30	13	No
<i>Quercus kelloggii</i>	11	30	66	No
<i>Pinus jeffreyi</i>	12	30	11	No
<i>Pinus jeffreyi</i>	13	30	10	No
<i>Pinus jeffreyi</i>	14	40	18	No
<i>Pinus jeffreyi</i>	15	65	31	Yes
<i>Quercus kelloggii</i>	16	45	34	No
<i>Pinus jeffreyi</i>	17	50	20	No
<i>Pinus jeffreyi</i>	18	20	7	Yes
<i>Pinus jeffreyi</i>	19	100	37	No
<i>Pinus jeffreyi</i>	20	75	40	No
<i>Pinus jeffreyi</i>	21	20	9	Yes
<i>Pinus jeffreyi</i>	22	25	13	Yes
<i>Pinus jeffreyi</i>	23	110	37	No
<i>Pinus jeffreyi</i>	24	80	37	No
<i>Pinus jeffreyi</i>	25	45	15	No
<i>Quercus chrysolepis</i>	26	40	28	Yes
<i>Pinus jeffreyi</i>	27	80	40	No
<i>Pinus jeffreyi</i>	28	80	39	No
<i>Pinus jeffreyi</i>	29	90	35	No
<i>Pinus jeffreyi</i>	30	7	6	No
<i>Pinus jeffreyi</i>	31	20	7	No

<i>Pinus jeffreyi</i>	32	75	45	No
<i>Pinus jeffreyi</i>	33	55	25	No
<i>Pinus jeffreyi</i>	34	65	27	No
<i>Pinus jeffreyi</i>	35	25	9	No
<i>Pinus jeffreyi</i>	36	70	45	No
<i>Pinus jeffreyi</i>	37	55	19	No
<i>Pinus jeffreyi</i>	38	25	12	No
<i>Pinus jeffreyi</i>	39	45	22	No
<i>Quercus chrysolepis</i>	40	30	31	No
<i>Quercus kelloggii</i>	41	35	19	No
<i>Quercus kelloggii</i>	42	35	19	No
<i>Quercus chrysolepis</i>	43	35	23	No
<i>Quercus chrysolepis</i>	44	30	34	No
<i>Quercus chrysolepis</i>	45	35	95	No
<i>Pinus jeffreyi</i>	46	70	34	No
<i>Pinus jeffreyi</i>	47	50	23	No
<i>Pinus jeffreyi</i>	48	55	31	No
<i>Pinus jeffreyi</i>	49	45	17	No
<i>Pinus jeffreyi</i>	50	50	17	No
<i>Quercus kelloggii</i>	51	40	62	No
<i>Pinus jeffreyi</i>	52	70	32	No
<i>Pinus jeffreyi</i>	53	20	6	No
<i>Pinus jeffreyi</i>	54	15	4	No
<i>Pinus jeffreyi</i>	55	50	19	No
<i>Pinus jeffreyi</i>	56	35	12	Yes
<i>Pinus jeffreyi</i>	57	15	4	No
<i>Pinus jeffreyi</i>	58	15	5	No
<i>Pinus jeffreyi</i>	59	55	18	No
<i>Pinus jeffreyi</i>	60	8	6	No
<i>Pinus jeffreyi</i>	61	15	5	No
<i>Pinus jeffreyi</i>	62	15	5	No
<i>Pinus jeffreyi</i>	63	15	6	No
<i>Pinus jeffreyi</i>	64	10	3	No
<i>Pinus jeffreyi</i>	65	8	2	No
<i>Pinus jeffreyi</i>	66	15	4	No

<i>Quercus kelloggii</i>	67	35	61	No
<i>Quercus kelloggii</i>	68	40	20	No
<i>Pinus jeffreyi</i>	69	65	20	No
<i>Pinus jeffreyi</i>	70	20	6	No
<i>Quercus kelloggii</i>	71	50	42	No
<i>Quercus chrysolepis</i>	72	25	32	No
<i>Quercus chrysolepis</i>	73	25	36	No
<i>Pinus jeffreyi</i>	74	30	14	Yes
<i>Pinus jeffreyi</i>	75	65	30	No
<i>Quercus wislizenii</i>	76	20	23	No
<i>Quercus wislizenii</i>	77	15	42	No
<i>Pinus jeffreyi</i>	78	30	17	No
<i>Pinus jeffreyi</i>	79	25	13	No
<i>Pinus jeffreyi</i>	80	65	28	No
<i>Pinus jeffreyi</i>	81	70	25	No
<i>Pinus jeffreyi</i>	82	7	4	No
<i>Pinus jeffreyi</i>	83	45	18	No
<i>Pinus jeffreyi</i>	84	30	12	No
<i>Pinus jeffreyi</i>	85	30	8	No
<i>Pinus jeffreyi</i>	86	70	20	No
<i>Pinus jeffreyi</i>	87	25	8	No
<i>Pinus jeffreyi</i>	88	70	19	No
<i>Pinus jeffreyi</i>	89	15	5	No
<i>Pinus jeffreyi</i>	90	75	28	No
<i>Pinus jeffreyi</i>	91	12	4	No
<i>Pinus jeffreyi</i>	92	12	4	Yes
<i>Quercus kelloggii</i>	93	50	35	No
<i>Quercus kelloggii</i>	94	50	59	No
<i>Pinus jeffreyi</i>	95	50	13	Yes
<i>Pinus jeffreyi</i>	96	40	11	Yes
<i>Pinus jeffreyi</i>	97	65	29	No
<i>Pinus jeffreyi</i>	98	50	19	Yes
<i>Pinus jeffreyi</i>	99	75	36	No
<i>Pinus jeffreyi</i>	100	75	29	No
<i>Pinus jeffreyi</i>	101	40	15	No

<i>Pinus jeffreyi</i>	102	25	7	No
<i>Pinus jeffreyi</i>	103	60	22	No
<i>Pinus jeffreyi</i>	104	50	12	No
<i>Pinus jeffreyi</i>	105	45	21	No
<i>Quercus kelloggii</i>	106	40	40	No
<i>Pinus jeffreyi</i>	107	40	14	No
<i>Pinus jeffreyi</i>	108	50	24	No
<i>Pinus jeffreyi</i>	109	40	21	No
<i>Pinus jeffreyi</i>	110	70	40	No
<i>Pinus jeffreyi</i>	111	60	25	No
<i>Pinus jeffreyi</i>	112	40	22	Yes
<i>Quercus chrysolepis</i>	113	35	73	No
<i>Calocedrus decurrens</i>	114	60	49	No
<i>Calocedrus decurrens</i>	115	55	34	No
<i>Quercus chrysolepis</i>	116	40	36	No
<i>Quercus chrysolepis</i>	117	35	31	No
<i>Pinus jeffreyi</i>	118	10	4	No
<i>Quercus chrysolepis</i>	119	20	16	No
<i>Quercus chrysolepis</i>	120	15	27	No
<i>Pinus jeffreyi</i>	121	10	7	Yes
<i>Quercus chrysolepis</i>	122	30	20	Yes
<i>Quercus chrysolepis</i>	123	20	15	Yes
<i>Quercus chrysolepis</i>	124	25	31	Yes
<i>Quercus chrysolepis</i>	125	30	23	Yes
<i>Quercus chrysolepis</i>	126	15	19	Yes
<i>Pinus jeffreyi</i>	127	40	12	Yes
<i>Quercus chrysolepis</i>	128	15	31	Yes
<i>Pinus jeffreyi</i>	129	30	17	Yes
<i>Quercus chrysolepis</i>	130	20	23	Yes
<i>Quercus chrysolepis</i>	131	20	19	Yes
<i>Pinus jeffreyi</i>	132	60	27	Yes
<i>Pinus jeffreyi</i>	133	70	39	No
<i>Pinus jeffreyi</i>	134	55	24	No
<i>Pinus jeffreyi</i>	135	40	15	No
<i>Pinus jeffreyi</i>	136	60	27	No

<i>Calocedrus decurrens</i>	137	40	32	No
<i>Quercus chrysolepis</i>	138	25	27	No
<i>Quercus wislizenii</i>	139	20	42	No
<i>Calocedrus decurrens</i>	140	60	53	No
<i>Pinus jeffreyi</i>	141	55	19	No