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Report on the Threatened Valley Elderberry Longhorn Beetle and its Elderberry Food Plant at the Lawrence Livermore National Laboratory--Site 300

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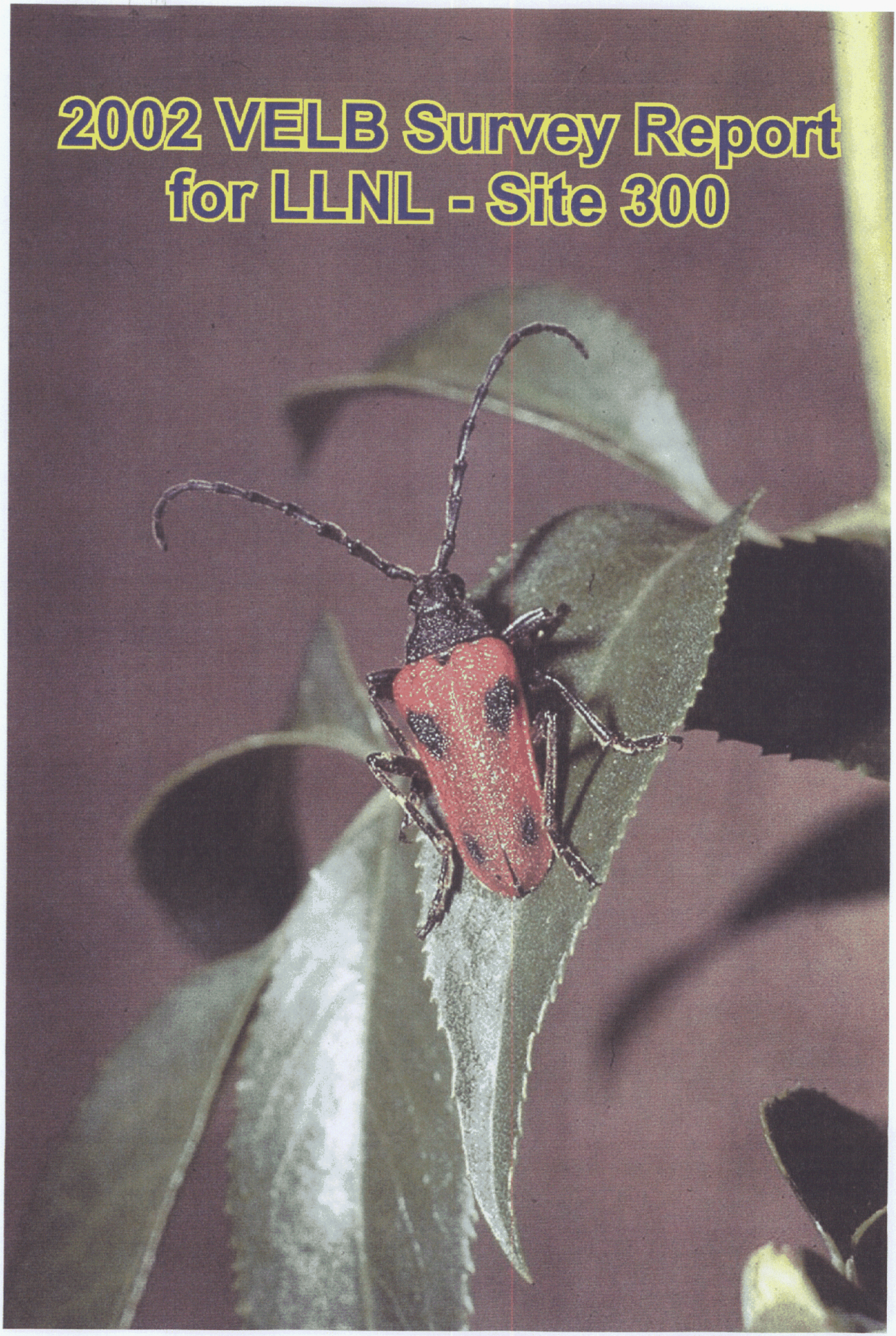
2002 VELB Survey Report for LLNL - Site 300



REPORT ON THE

THREATENED VALLEY ELDERBERRY LONGHORN BEETLE

AND ITS ELDERBERRY FOOD PLANT

AT THE LAWRENCE LIVERMORE NATIONAL LABORTORY – SITE 300

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INTRODUCTION

This report describes the results of an entomological survey in 2002 to determine the presence of the federally-listed, threatened Valley Elderberry Longhorn Beetle or "VELB" (*Desmocerus californicus dimorphus*: Coleoptera, Cerambycidae) and its elderberry food plant (*Sambucus mexicana*: Caprifoliaceae) on the Lawrence Livermore National Laboratory's (LLNL) Experimental Test Site, known as Site 300. In addition, an area located immediately southeast of Site 300, which is owned and managed by the California Department of Fish and Game (CDFG), but secured by LLNL, was also included in this survey. This report will refer to the survey areas as the LLNL-Site 300 and the CDFG site.

The 2002 survey included mapping the locations of elderberry plants that were observed using a global positioning system (GPS) to obtain positional coordinates for every elderberry plant at Site 300. In addition, observations of VELB adults and signs of their infestation on elderberry plants were also mapped using GPS technology.

LLNL requested information on the VELB and its elderberry food plants to update earlier information that had been collected in 1991 (Arnold 1991) as part of the 1992 EIS/EIR for continued operation of LLNL. No VELB adults were observed as part of this prior survey. The findings of the 2002 survey reported herein will be used by LLNL as it updates the expected 2004 Environmental Impact Statement for ongoing operations at LLNL, including Site 300.

SITE DESCRIPTION

LLNL Site 300 encompasses approximately 7,000 acres and is located about 15 miles east of Livermore, CA. It is situated in portions of both Alameda and San Joaquin counties. The elevation of the survey area ranges from about 250 feet to 1,750 feet above sea level. The area is typical of grasslands found in the interior foothills of the Coast Range where it borders on the Central Valley of California. While annual grasses and herbs dominate the plant species found there are pockets of riparian vegetation, typically located near creeks and seeps, in the area. Solitary or small groups of oaks and chaparral are scattered throughout the area surveyed, but occur primarily in the southwestern sector of Site 300.

BACKGROUND INFORMATION ON THE VELB

Conservation Status.

In 1978, the U.S. Fish and Wildlife Service (USFWS) proposed to recognize the VELB as a threatened species with critical habitat. In 1980, the USFWS listed the VELB as a threatened species and designated two areas along the American River in the city of Sacramento as critical habitat (USFWS 1980). In 1984, the USFWS published a recovery plan for the VELB (USFWS 1984), summarizing information about the beetle's

taxonomy, biology, distribution, and habitat, and population decline. It also identified conservation measures to protect the beetle's habitat and manage its populations.

Other resource agencies and organizations have followed the lead of the USFWS and designated the VELB as a special-status species. The International Union for the Conservation of Nature (IUCN) recognized the VELB as a vulnerable species in its 1990 Red List of Threatened Animals (IUCN 1990). The vulnerable category of the IUCN is essentially equivalent to the threatened category of the USFWS. The California Natural Diversity Data Base (CNDDB) recognizes the beetle as a G3T2S2 taxon (California Department of Fish and Game 1992). Neither the IUCN nor state designations afford the VELB any legal protection.

Taxonomy and Description.

The VELB is a member of the longhorn beetle family known as Cerambycidae. Adults range in length from about 15 to 25 millimeters and are red and black. The common name longhorn beetle refers to the long antennae, which extend to at least the middle of the abdomen. A photograph of the VELB is on the cover page of this report.

Desmocerus californicus was described by Horn in 1881 from a specimen collected in Southern California. The VELB was originally described as a separate species, *Desmocerus dimorphus* by Fisher (1921) based on the coloration of the adult males. The city of Sacramento was designated as the type locality. Subsequently, Linsley and Chemsak (1972) treated the two as subspecies and designated the latter as *Desmocerus californicus dimorphus* Fisher.

The two subspecies can be distinguished on the basis of the color pattern of the male elytra (first pair of wings) and hairs on the antenna. Nearly the entire elytra of males of *californicus* are dark, while the dark color on the elytra of *dimorphus* is usually reduced to four oblong spots. Hairs on the basal antennal segments of *californicus* are dark, while those on *dimorphus* are pale. Some *dimorphus* males also exhibit the elytral color pattern of the nominate subspecies.

Geographic Distribution.

The VELB was recognized as a threatened species because of loss and alteration of its riparian habitat and because it naturally occurs at low population densities. In the Central Valley, the VELB is generally found along waterways and in floodplains that support remnant stands of riparian vegetation. In particular, elderberry must be present, as both larvae and adults feed on this shrub or small tree. More recently, the VELB has also been observed in the Sierra foothills, particularly in Fresno, Madera, and Placer Counties, at elevations up to about 3,000 feet (USFWS 1996). At these foothill locations, the VELB and its elderberry food plant are not always restricted to riparian habitats, but may also occur in foothill woodland and scrub communities.

The historical distribution of the VELB is not well documented, but it is assumed to have occurred throughout much of the Central Valley in association with riparian habitats. However, the substantial loss and alteration of riparian vegetation in the Central

Valley during the past 150 years suggests that the beetle's range has similarly been reduced, overall population numbers have declined, and that remaining populations are now discontinuous (USFWS 1984).

Linsley and Chemsak (1972) reported the geographic range of the VELB as the lower Sacramento Valley and upper San Joaquin Valley. Surveys conducted after the beetle's recognition as a threatened species have demonstrated that the VELB is more widespread than originally believed. At this time, the VELB is known from widely scattered localities in the Central Valley. Adult specimens have been collected in locations ranging from the Kaweah River in Tulare County by Halstead (1991) to Red Bluff in Tehama County by Jones & Stokes Associates, Inc. (Jones & Stokes Associates, Inc. 1987). Exit holes have been observed in elderberries growing as far north as the Shasta-Tehama county line (Barr 1991) and as far south as Caliente Creek in Kern County (Shields 1990a and 1990b). Figure 1 illustrates the known geographic distribution of the VELB.

An exit hole, possibly of the VELB, was found on the LLNL – Site 300 in 1991 (Arnold 1991). During the 2002 surveys, described in this report, adult beetles were observed and identified as the VELB at LLNL – Site 300.

Ecology and Habitats.

Although the VELB's life history has not been formally described in the entomological literature, it is assumed to follow a sequence of events similar to those of related taxa whose life histories are better known (Burke 1921 and Craighead 1923). The adult activity period generally coincides with the peak flowering period of the elderberry, typically in April and May. Female beetles deposit eggs in crevices in the bark of living elderberry plants. The eggs hatch within a few days after they are laid and the larvae bore into the pith of the trunk, stem, or roots. Larvae of the VELB feed internally on the pith of the trunk and larger branches, as well as the roots, while adult beetles appear to feed externally only on elderberry flowers and foliage. Larvae complete their development in 1 to 2 years. Prior to metamorphosing into the adult life stage, VELB larvae chew an emergence or exit hole in the trunk of the elderberry, through which the adult beetle later exits the plant. Davis and Comstock (1924) illustrate the larval and pupal stages.

The VELB's exit hole is about the diameter of a standard wooden pencil and somewhat oval in shape. Often there is some swelling on the trunk where the exit hole is found. Exit holes in the lower trunk of elderberries are characteristic of past VELB infestations. Several studies (cited in USFWS 1984 and Barr 1991) have found that exit holes generally occur between ground level and about 6 to 10 feet in height. Similar appearing holes in the upper trunk and branches may be due to other wood-feeding insects. However, Halstead (1991) has observed bona fide VELB exit holes as high as 25 feet in an elderberry. Fresh exit holes have been observed on stems whose diameters ranged from slightly less than 1 inch to about 8 inches.

Exit holes remain in the trunks of the elderberries even after the VELB has ceased using a particular elderberry. For this reason, the exit hole can be used as an indicator of

past infestation. Most exit holes that are observed on elderberries are older and difficult to date. However, recent holes can be readily distinguished based on the presence of larval frass (i.e., excrement) or a pupal case of the VELB, fresh wood shavings, and nonoxidized wood. Unfortunately, these signs usually disappear within a few weeks after a VELB leaves the elderberry. As such, recent exit holes are detected rather infrequently. Several other types of insects usually live in the tunnels created by the VELB larvae. These invading insects and insect-feeding birds often enlarge or modify older VELB exit holes to feed on these secondary insect inhabitants in the VELB tunnels.

Adult VELBs can fly, but they are not considered to be strong fliers; hence, their dispersal capabilities are probably somewhat limited, especially compared to migratory insects that may travel several hundred miles. Although the dispersal capabilities of the VELB are not well known, it is likely that they follow drainage courses where elderberries most commonly grow and may disperse as far as a few miles within their adult lifespan.

Throughout most of its geographic range, the VELB is closely associated with blue elderberry, *Sambucus mexicana* Presl. (Caprifoliaceae), which is the primary food plant for beetle larvae. *S. glauca* Nutt. and *S. caerulea* Raf. may also be used as food plants by the beetle, but taxonomic problems in the genus *Sambucus* due to phenotypic variability and hybridization between species often complicates accurate identification of elderberries.

Blue elderberry is a common riparian shrub (Roberts *et al.* 1977, Katibah *et al.* 1984, Warner 1984) in California that typically grows in a variety of riparian habitat types and elderberry savanna (Holland 1986), which borders riparian forests in some locations. USFWS (1996) considers the best quality VELB habitat to be where there is a mixture of associated riparian shrubs and trees growing with the elderberries. In a study of Sacramento Valley riparian vegetation, Conard *et al.* (1977) found that blue elderberry occurs mainly at an intermediate level in the floodplain in association with box elder *(Acer negundo)* and buttonbush *(Cephalanthus occidentalis).* In another study conducted along the Sacramento River (Jones & Stokes Associates, Inc. 1987), elderberries were found with VELB emergence holes in four types of overstory situations:

- young-growth riparian stands of young cotton woods and willows on the lower terrace;
- stands of mature and senescent cottonwoods on the lower terrace;
- mature riparian stands of mixed tree species, including cottonwood, box elder, northern California walnut *(Juglans hindsii),* or valley oak *(Quercus lobata),* on the higher terrace; and
- sites without an overstory in both higher and lower terrace areas.

In a study along the lower American River (Jones & Stokes Associates, Inc. 1995),

elderberries were found with VELB emergence holes in vegetation types characterized as montane riparian, south-slope oak woodland, grassland, and rocky ruderal.

SURVEY METHODS AND ANALYSIS

Project Team.

The project team consisted of Dr. Richard A. Arnold, President of Entomological Consulting Services, Ltd., and Robert Jensen, a specialist in GPS (global positioning system) and GIS (geographic information system) technologies. The project team completed the on-site survey work during four site visits – April 8 and 22, plus May 14 and 30, 2002. Mr. Jim Woollett, wildlife biologist at LLNL-Site 300, assisted with the elderberry inventory and VELB surveys. He also provided a map which illustrated the locations where he had observed elderberry plants at the facility in recent years.

VELB Surveys.

Two types of surveys were conducted for the VELB:

a) presence-absence surveys for adults; and
b) inspections of elderberry plants for signs of past infestation as evidenced by exit holes.

During each site visit the project team conducted visual surveys of individual elderberry plants and stands of elderberry at LLNL – Site 300. Foliage, flowers, and stems of the elderberries were systematically surveyed using close-focusing and regular binoculars to detect VELB adults that were foraging, resting, and thermoregulating. Flying insects of the general size and color of the VELB were also carefully observed to detect flying VELB adults. When an adult VELB was observed, the UTM (Universal Transverse Mercator) coordinates of its location were obtained using the GPS.

In addition, stems of the elderberry plants were inspected for VELB emergence holes, a sign of VELB infestation. Efforts were concentrated on mature plants with stems larger than 1 inch in diameter and between ground level and about 60 inches above ground level. When an emergence hole was observed, the UTM coordinates for the plant's location was obtained using the GPS. While the project team concentrated its efforts to find evidence of the beetle to areas where the elderberry plants were concentrated and numerous, all areas that were accessible were inspected for signs of VELB infestation. Since a few plants were not accessible due to the terrain, the incidence of VELB infestation could be greater than that reported.

Mapping of Elderberries.

Locations of observed elderberry plants, plus VELB adults and exit holes were mapped using a Trimble™ XR Pro Global Positioning System (GPS) unit with submeter, real time precision. An Atlanta Laser™ rangefinder was used to record the locations of the elderberry plants that were not readily accessible to the team. At the time the location of each elderberry plant was recorded, features of plant growth and evidence of the beetle

(adults and/or emergence holes) was also recorded. The plant characteristics recorded were: health (good, poor), trunk type (multiple stems, single stem), and age class (mature, sapling). Mature plants generally have basal stem diameters greater than 1 inch, while basal stem diameters of saplings are generally less than 1 inch. Locations of dead elderberry plants were not recorded. Causes of death were not always obvious.

Data Analysis.

The information collected during the field surveys was stored in the data logger of the GPS. In the office it was transferred to a spreadsheet program (Microsoft's EXCEL) for data management and analysis and to link the data to the geographic information system programs (GIS) for the preparation of maps. Two mappings programs were used, including Pathfinder Office™ (from Trimble) and ArcView GIS 3.2a (from Environmental Systems Research Institute, Inc. [ESRI]). The tables and figures presented in this report were developed using the aforementioned programs. Electronic copies of the data and GIS files were provided on a CD-ROM to Jim Woollett.

RESULTS AND DISCUSSION

VELB Surveys.

Six adult beetles of *Desmocerus californicus* were observed at Area H (Figure 2) during our field visit to LLNL – Site 300 on April 22, 2002. Four of these adults exhibited the color pattern and markings shared by both subspecific taxa, *californicus* and *dimorphus*. Two adults exhibited the color pattern and markings characteristic of the endangered taxon, *dimorphus*. As its subspecific name indicates, populations of the VELB consist of individuals representing both phenotypes. For this reason, I conclude that the elderberry beetle population at Site 300 is the VELB.

The occurrence of the VELB at LLNL – Site 300 is a range extension for this taxon, as it was previously known (Barr 1991 and USFWS 1984) primarily from locations on the floor of the Central Valley. More recently, however, it also has been observed at several locations in the foothills of the Sierra Nevada range, so its discovery in the interior foothills of the Coast Range at LLNL – Site 300 is not that surprising.

Evidence of the VELB was observed at LLNL – Site 300 during all four field visits. In addition to the six adults observed at Area H, 16 emergence holes were observed at LLNL – Site 300 and the CDFG site. The exit holes were concentrated in two locations, with six at Area F and 10 at Area H (Figures 2, 8, and 10).

Elderberry Mapping.

We confirmed the presence of elderberry plants at all but one of the locations where Jim Woollett had previously observed them. While the entire LLNL – Site 300 was not thoroughly walked to search for additional locations, we scanned the hills and valleys using binoculars and a 20x spotting scope in an effort to detect previously unknown individuals and stands of the elderberry. However, no new locations were found.

Three hundred thirty-eight (338) elderberry plants were located – 248 plants grow in six areas at LLNL – Site 300 and 90 plants grow in two areas at the CDF&G site. Figure 2 illustrates the locations of all eight groups of elderberry plants, Areas A through H, while Figures 3 through 10 are detail maps that illustrate the locations of all individual elderberry plants, plus observed adult beetles and exit holes, within each group. Individual plant identification numbers, as used in the Appendix, are provided for selected plants on the detail map (Figures 3 through 10).

Table 1 provides a summary of the numbers of elderberries observed in each area. The appendix to this report provides the complete elderberry inventory information. Also, the ArcView GIS shape files used to produce all of the figures are also included on a separate disk so the figures or new maps can be printed out in a larger format.

Elderberry plants were observed growing under a variety of conditions at LLNL – Site 300 and the CDFG site. These included along intermittent drainages or seeps in canyon bottoms, in riparian habitat, in association with rock outcrops, and on slopes and ledges of canyon walls. The vast majority of all observed elderberry plants are mature (90%), have multiple trunks (90%) rather than solitary trunks, and are in good condition (90%), as described in Table 1, which also provides this information for each of the eight elderberry areas.

All VELB adults and emergence holes were found in two (Areas H and F) of the eight areas where elderberries were observed growing (Table 1 and Appendix). These locations were characterized by higher densities of healthy elderberry plants and proximity to seasonal water. Area H is the canyon area north of Linac Road, where the elderberries grow along an intermittent drainage that flows into Elk Ravine. This was the largest stand of elderberries observed at LLNL – Site 300. Similarly, Area F at the CDFG site, is adjacent to Corral Hollow Creek and its riparian vegetation. In contrast, elderberries growing at the other six areas occurred at low density and were generally not associated with other riparian vegetation.

RECOMMENDATIONS

The discovery of the VELB at LLNL – Site 300 and the neighboring CDFG site is a range extension for the threatened beetle, since the closest, previously known locations were from the floor of the Central Valley. Current and future activities at LLNL – Site 300 will need to avoid potential direct and indirect impacts to the VELB, otherwise a permit for incidental take of the VELB will be required to comply with the Endangered Species Act. To a large degree, this can be accomplished by avoiding the elderberry food plants of the VELB. USFWS (1999) provides guidance for avoidance measures. At this point in time, none of the elderberry areas are located near active construction sites, so the primary activities at LLNL – Site 300 that might now adversely impact the elderberry plants are probably the maintenance of dirt roads and fire breaks. A few elderberry plants currently grow close enough to existing dirt road beds that even light grading could

damage their roots or even result in partial or complete removal of these plants. In addition, dust generated by the grading activities may adversely affect these elderberries and in particular, the VELB adults, if the grading occurs during the March and April flight season of the beetle.

Birds, especially various sparrows (Emberizidae), eat the elderberries and disperse their seeds. For this reason, it is advisable to periodically resurvey the entire LLNL – Site 300 to identify new locations that support elderberry plants. These surveys would also be useful to monitor the known elderberry locations to demonstrate that on-going activities at LLNL – Site 300 are not adversely affecting the plants and VELB. Under the current guidelines from USFWS (1999), elderberry plants with a basal stem diameter equal to or greater than one inch are considered to be habitat for the VELB. Since new plants and additional stems at existing elderberry locations can grow to this threshold stem diameter within one year after germination, monitoring surveys should occur at time intervals to detect such changes. By conducting these monitoring surveys and working closely with LLNL-Site 300 staff, I believe that adverse impacts to the elderberry plants and VELB can be avoided.

If current or future activities at LLNL – Site 300 are likely to impact any elderberries, the plants must be inventoried in the manner described by the USFWS guidelines (1999). The data collected during the 2002 does not include all growth characteristics required by USFWS (1999). Also, the inventory findings are applicable for only two years from the date of the inventory (USFWS 1999) and no specific projects were identified at any of the elderberry locations at the time the inventory was performed at LLNL-Site 300 in 2002. An example of additional data required is the basal diameter of all trunks, which must be measured and categorized into the size categories. Tallies of the numbers of trunks by size class is one of the factors used by USFWS (1999) to determine acceptable mitigation requirements for anticipated direct and indirect impacts to any elderberries.

Table 1: Numbers of VELB Adults and Emergence Holes, Elderberry Plant Numbers and Characteristics by Study Area.

Observation or Feature	LLNL – Site 300						CDFG Site		Totals
	Area A	Area B	Area C	Area D	Area E	Area H	Area F	Area G	All Areas
Number of Adult Beetles Observed	0	0	0	0	0	6	0	0	6
Number of Emergence Holes Observed	0	0	0	0	0	10	6	0	16
Number of Elderberry Plants Located in Area	22	2	11	8	2	203	83	7	338
Percentage of Elderberry Plants Classified as Mature (Versus Saplings)	95%	100%	73%	75%	50%	91%	90%	100%	90%
Percentage of Elderberry Plants Classified as Multiple Stemmed (Versus Single Stemmed)	68%	100%	82%	75%	100%	89%	72%	100%	90%
Percentage of Elderberry Plants Classified as in Good Condition (Versus Poor)	86%	100%	100%	100%	100%	91%	100%	100%	90%

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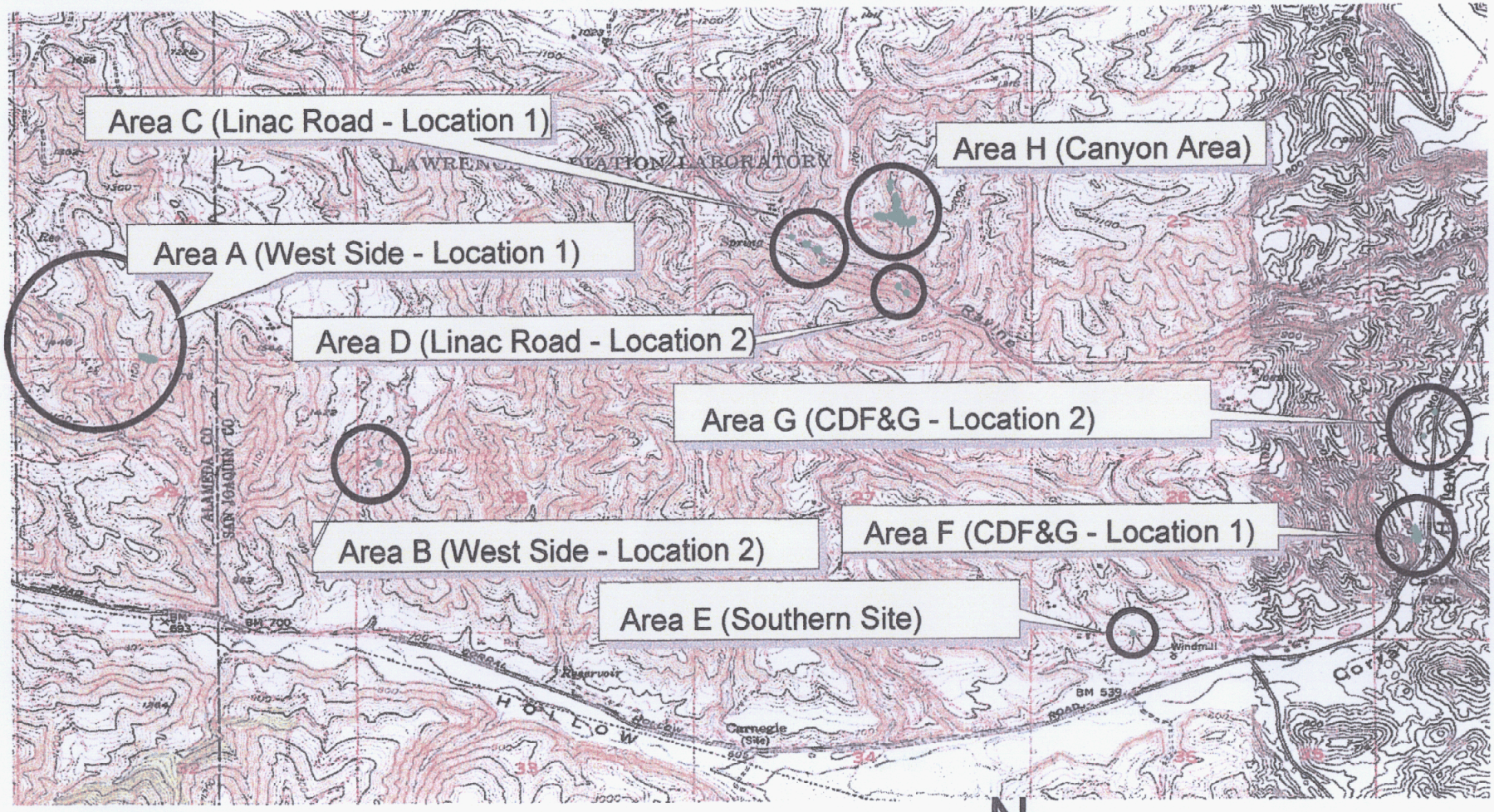
FIGURES

Figure 1. Map illustrating known geographic range of VELB.

Figure 2: Key to Detailed Maps
LLNL - Site 300
Spring 2002 VELB Survey



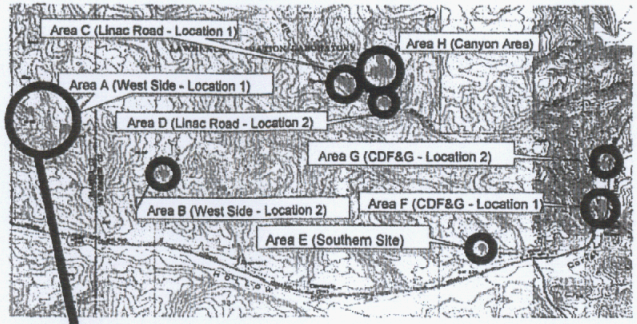
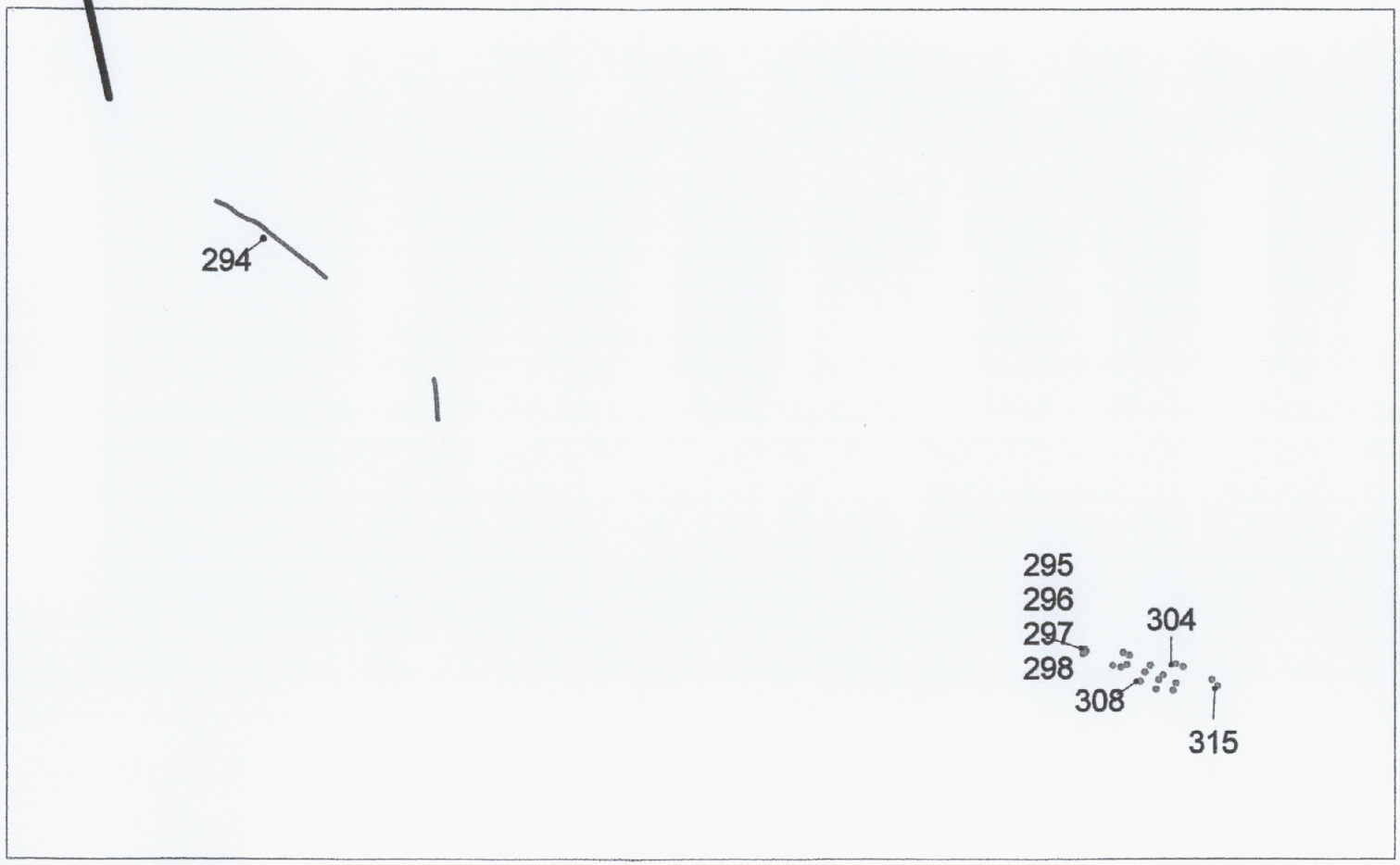


Figure 3: Location of Elderberry Plants
Area A (West Side - Location 1)
LLNL - Site 300
Spring 2002 VELB Survey



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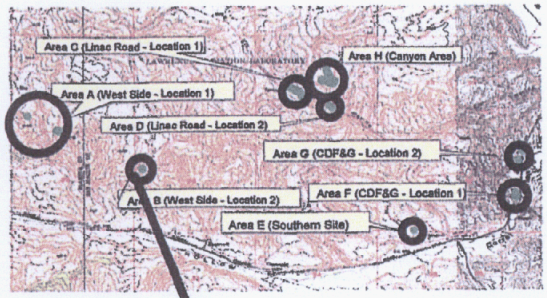
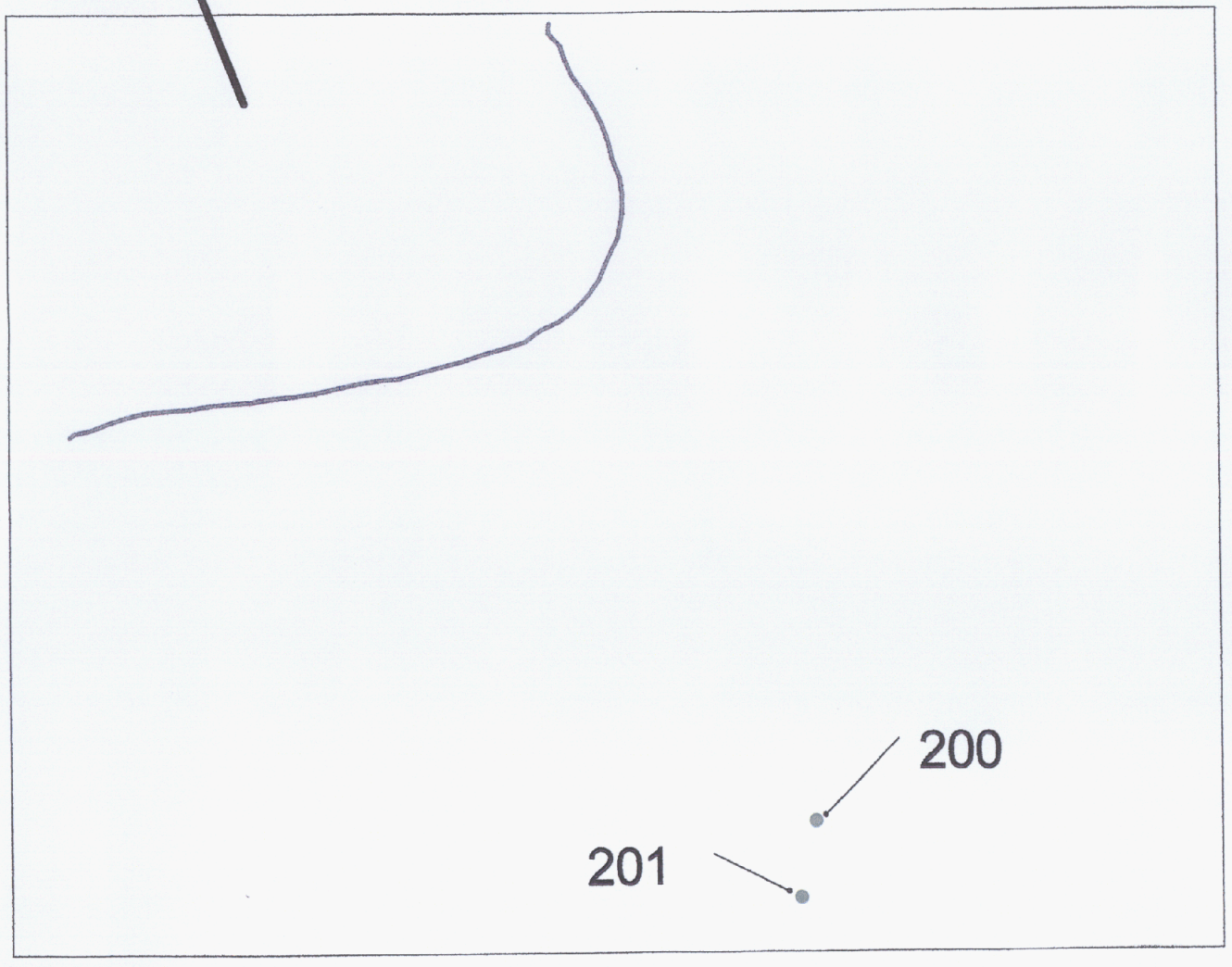
500 0 500 1000 Feet

Elderberry Plants
Sections of Roads

Figure 4: Location of Elderberry Plants
Area B (West Side - Location 2)
LLNL - Site 300
Spring 2002 VELB Survey





N

100 0 100 200 Feet

Elderberry Plants
Section of Road

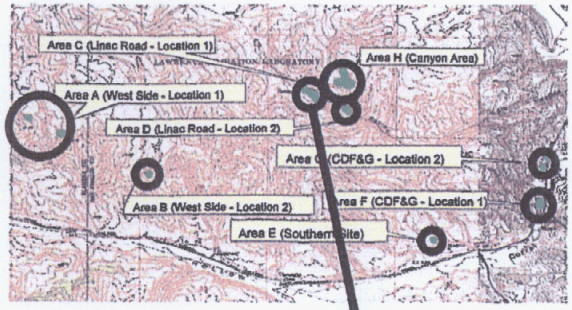
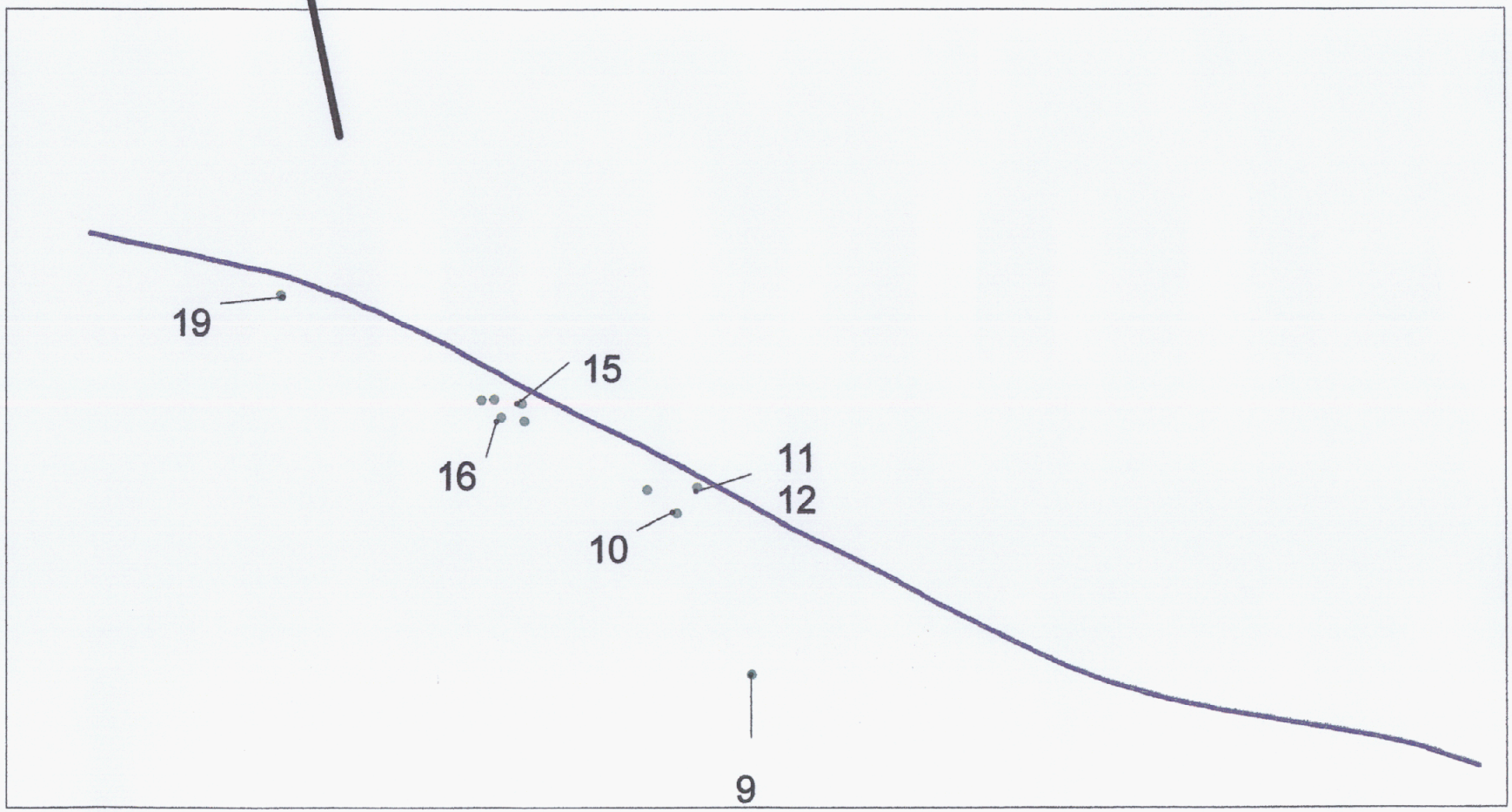


Figure 5: Location of Elderberry Plants
Area C (Linac Road - Location 1)
LLNL - Site 300
Spring 2002 VELB Survey



0 500 Feet

Elderberry Plants
Section of Road

N

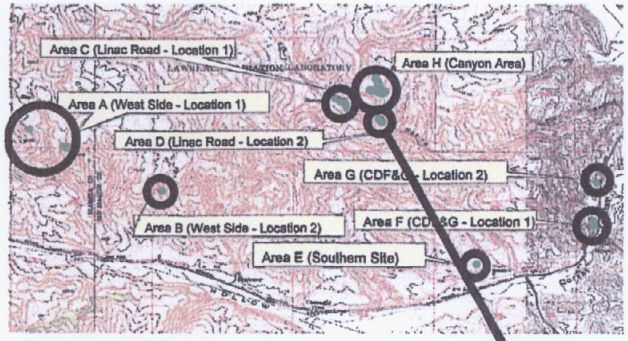
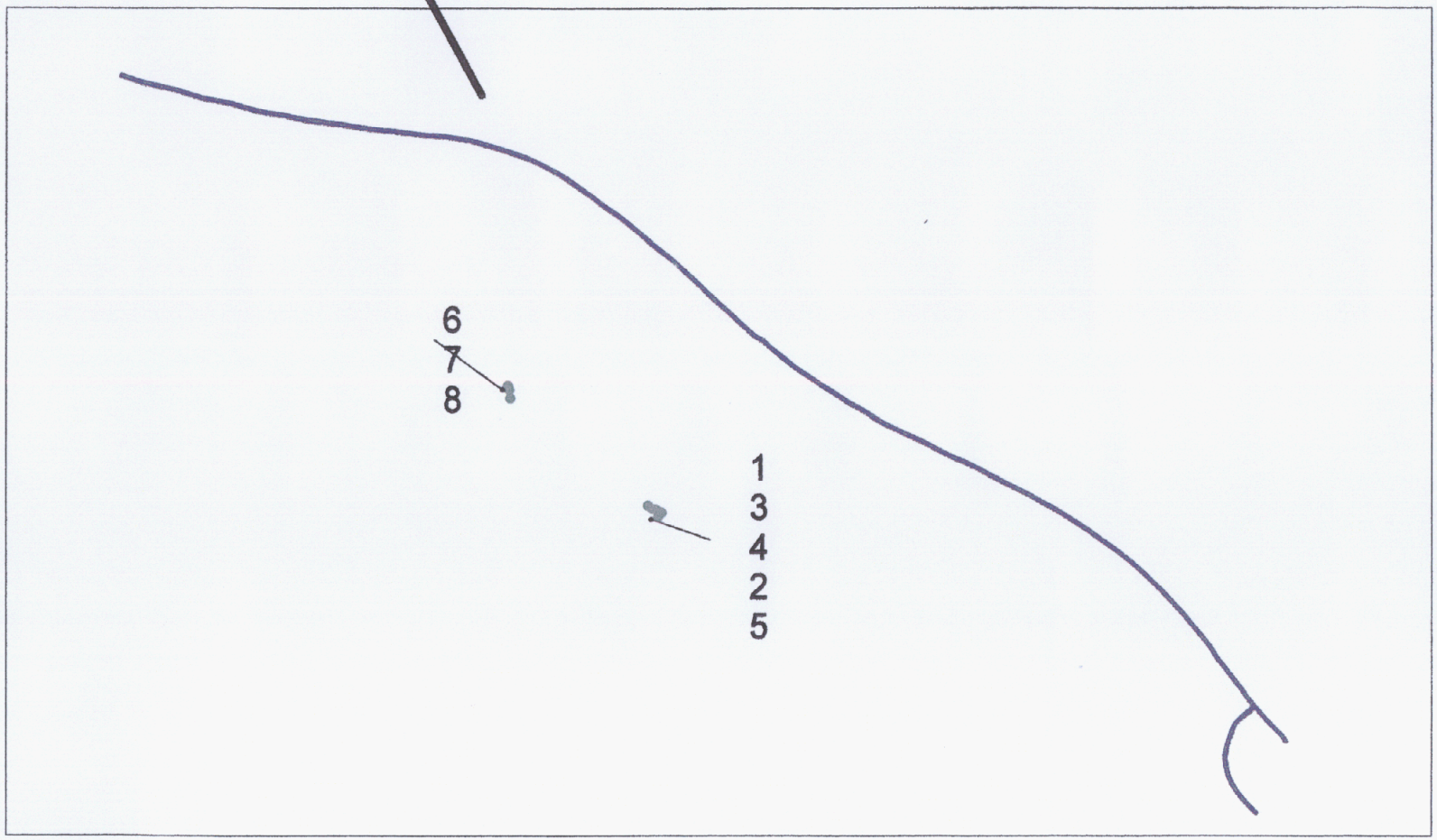


Figure 6: Location of Elderberry Plants
Area D (Linac Road - Location 2)
LLNL - Site 300
Spring 2002 VELB Survey



0 400 Feet

Elderberry Plants

Section of Road

N

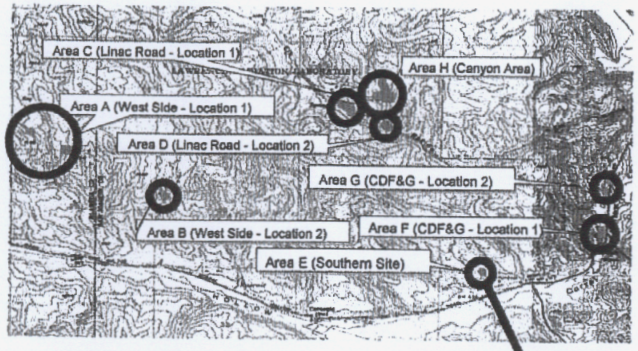
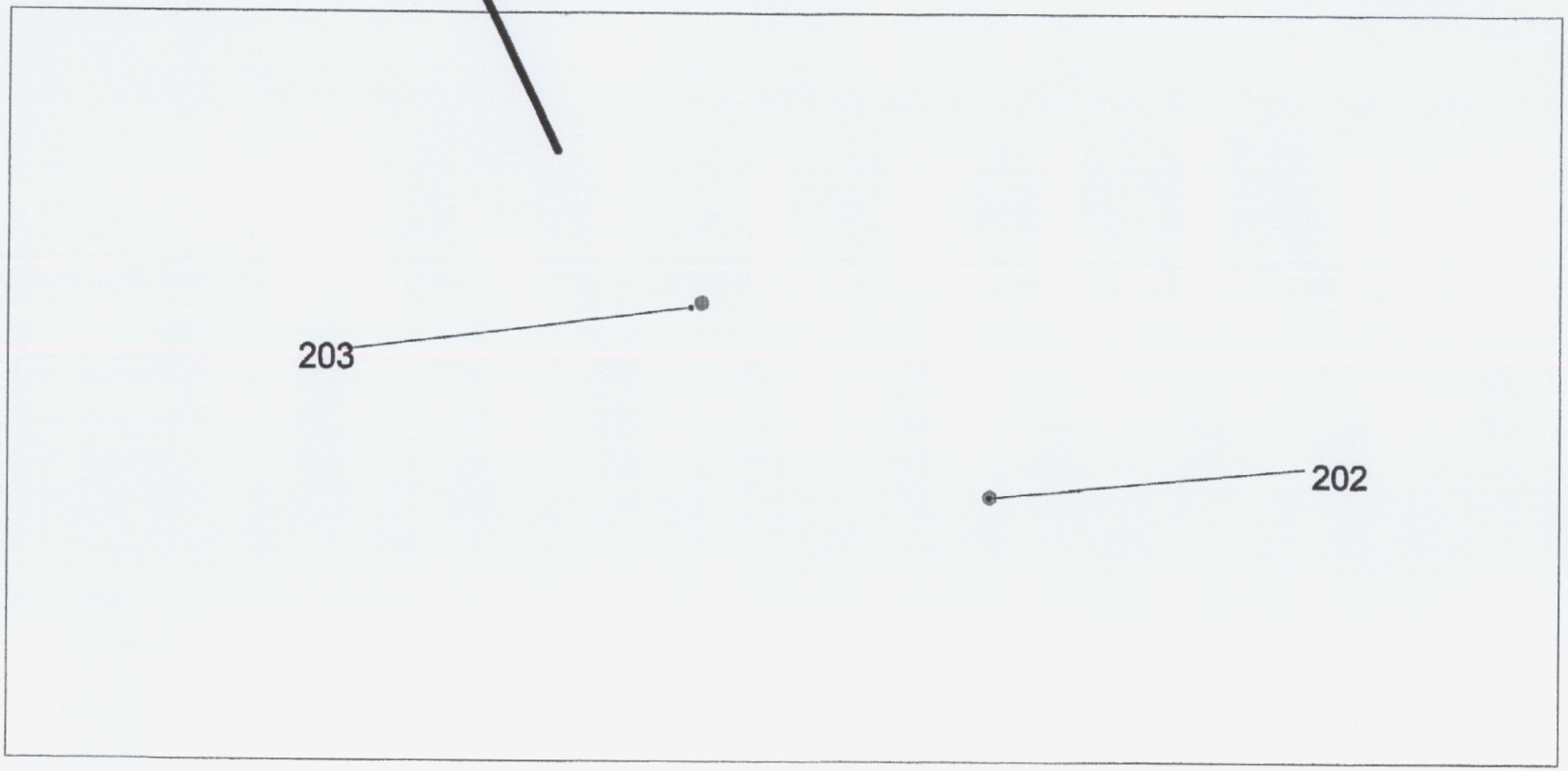


Figure 7: Location of Elderberry Plants
Area E (Southern Site)
LLNL - Site 300
Spring 2002 VELB Survey

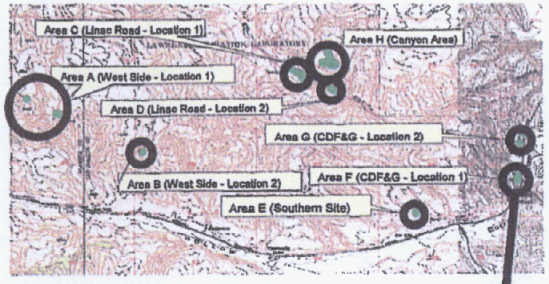


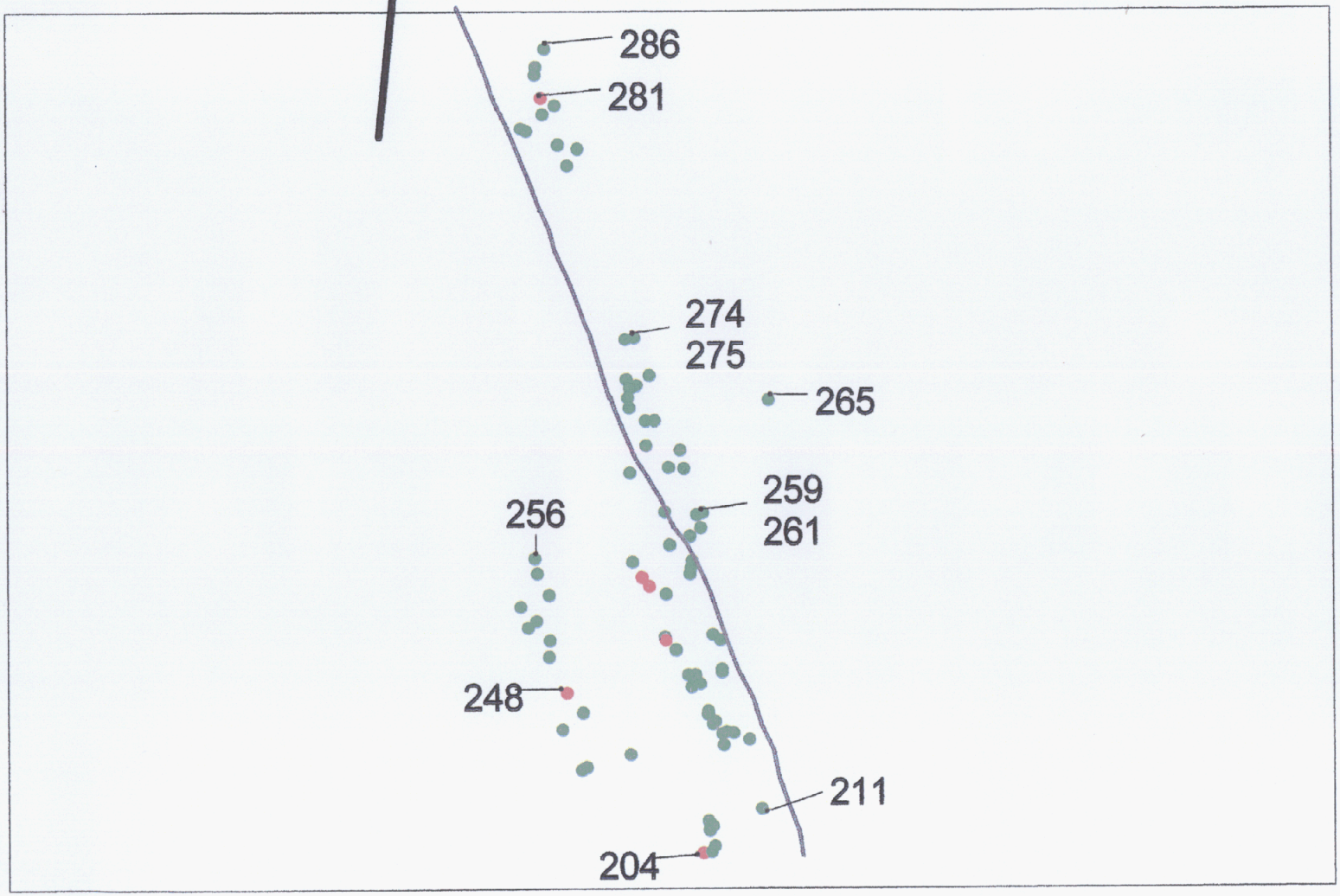
N

9 0 9 Feet

● Elderberry Plants

Figure 8: Location of Elderberry Plants
Area F (CDF&G - Location 1)
LLNL - Site 300
Spring 2002 VELB Survey





40 0 40 80 Feet

Section of Road

Elderberry Plants

- Elderberry Plant
- Emergence Hole Observed

N

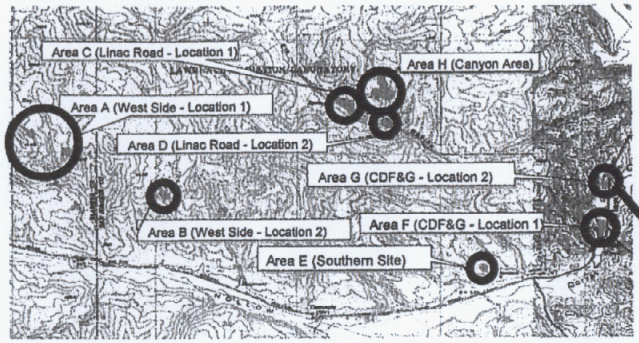
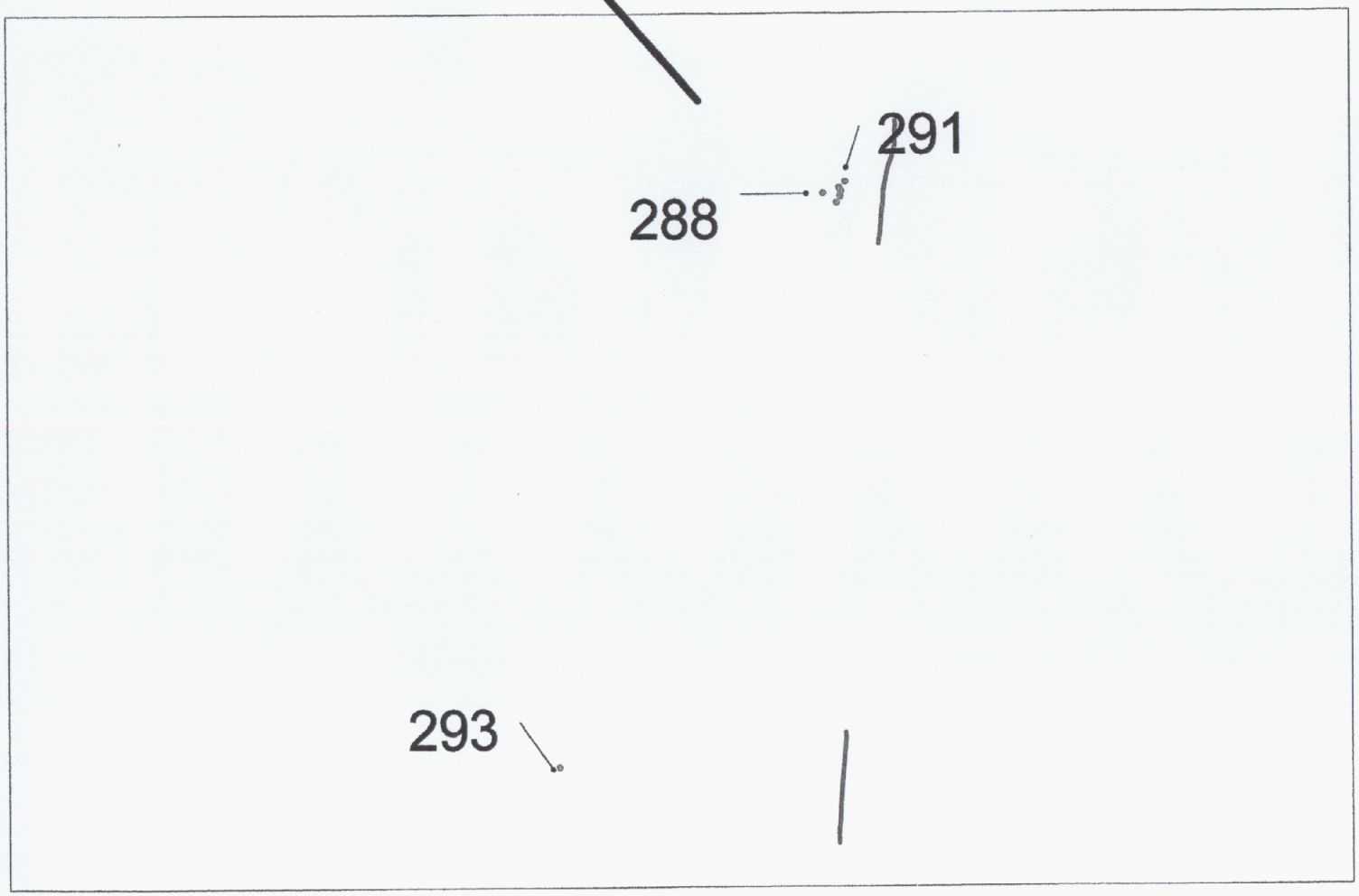


Figure 9: Location of Elderberry Plants
Area G (CDF&G - Location 2)
LLNL - Site 300
Spring 2002 VELB Survey



200 0 200 Feet

Elderberry Plants
Section of Road

N

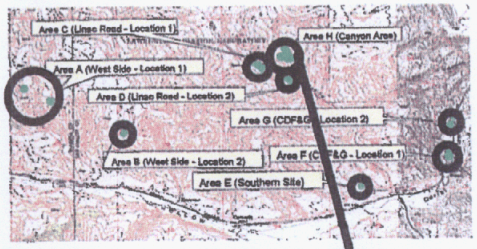


Figure 10: Location of Elderberry Plants
Area H (Canyon Area)
LLNL - Site 300
Spring 2002 VELB Survey

197
196
194
174
175
160
156
123
124
139
114
320
115
109
50
51
33

N

Section of Road
Elderberry Plants
Elderberry Plant
Beetle Observed
Emergence Hole Observed

300 0 300 Feet

APPENDIX:

ELDERBERRY INVENTORY DATA

Collected by:
Dick Arnold Robert Jensen

LLNL - Site 300
2002 VELB Survey

Date printed:
8/7/2002

	A	B	C	D	E	F	G	H	I	J
	Seq. No.	LLNL or CDF&G	Area Plotted in Figures	Plant No. (new)	Growth Type	Trunk Type	Plant Health	Presence of VELB	LLNL Map Area	Notes
	1	Site 300	D	1	Sapling	Single	Good		2 areas west of Ravine Rd	
	2	Site 300	D	2	Sapling	Single	Good		of Ravine Rd	
	3	Site 300	D	3	Mature	Multiple	Good			
	4	Site 300	D	4	Mature	Multiple	Good			
	5	Site 300	D	5	Mature	Multiple	Good			
	6	Site 300	D	6	Mature	Multiple	Good			
	7	Site 300	D	7	Mature	Multiple	Good			
	8	Site 300	D	8	Mature	Multiple	Good			
0	9	Site 300	C	9	Mature	Multiple	Good			
1	10	Site 300	C	10	Mature	Multiple	Good			
2	11	Site 300	C	11	Mature	Multiple	Good			
3	12	Site 300	C	12	Mature	Multiple	Good			
4	13	Site 300	C	13	Mature	Multiple	Good			
5	14	Site 300	C	14	Mature	Multiple	Good			
6	15	Site 300	C	15	Mature	Multiple	Good			
7	16	Site 300	C	16	Mature	Multiple	Good			
8	17	Site 300	C	17	Sapling	Single	Good			
9	18	Site 300	C	18	Sapling	Multiple	Good			
0	19	Site 300	C	19	Sapling	Single	Good			
1	20	Site 300	H	20	Mature	Multiple	Good	1 adult	In canyon on South Side	Broken trunk - 5 feet above ground
2	21	Site 300	H	21	Mature	Multiple	Good		south side	
3	22	Site 300	H	22	Mature	Multiple	Good			
4	23	Site 300	H	23	Mature	Multiple	Good	1 adult		Broken trunk - 5 feet above ground
5	24	Site 300	H	24	Sapling	Multiple	Good			
6	25	Site 300	H	25	Sapling	Multiple	Good			
7	26	Site 300	H	26	Sapling	Multiple	Good			
8	27	Site 300	H	27	Sapling	Multiple	Good			
9	28	Site 300	H	28	Sapling	Multiple	Good			
0	29	Site 300	H	29	Sapling	Multiple	Good			
1	30	Site 300	H	30	Mature	Single	Good			
2	31	Site 300	H	31	Mature	Multiple	Good			
3	32	Site 300	H	32	Sapling	Single	Good			
4	33	Site 300	H	33	Mature	Multiple	Good			
5	34	Site 300	H	34	Mature	Multiple	Good			
6	35	Site 300	H	35	Mature	Multiple	Good			
7	36	Site 300	H	36	Mature	Multiple	Good		Canyon	
8	37	Site 300	H	37	Mature	Single	Good		south side	
9	38	Site 300	H	38	Mature	Single	Good		(in mouth of)	
0	39	Site 300	H	39	Mature	Multiple	Good			
1	40	Site 300	H	40	Mature	Multiple	Good			
2	41	Site 300	H	41	Mature	Multiple	Good			

A	B	C	D	E	F	G	H	I	J
Seq. No.	LLNL or CDF&G	Area Plotted in Figures	Plant No. (new)	Growth Type	Trunk Type	Plant Health	Presence of VELB	LLNL Map Area	Notes
42	Site 300	H	42	Mature	Multiple	Good			
43	Site 300	H	43	Mature	Multiple	Good			
44	Site 300	H	44	Mature	Multiple	Good			
45	Site 300	H	45	Mature	Multiple	Good			
46	Site 300	H	46	Mature	Multiple	Good			
47	Site 300	H	47	Mature	Multiple	Good			
48	Site 300	H	48	Mature	Multiple	Good			
49	Site 300	H	49	Mature	Multiple	Good			
50	Site 300	H	50	Mature	Multiple	Good			
51	Site 300	H	51	Mature	Multiple	Good			
52	Site 300	H	52	Sapling	Multiple	Good		North side of	
53	Site 300	H	53	Mature	Multiple	Good		canyon	
54	Site 300	H	54	Mature	Multiple	Good	1 adult		
55	Site 300	H	55	Sapling	Single	Good			
56	Site 300	H	56	Mature	Multiple	Good			
57	Site 300	H	57	Mature	Multiple	Poor			
58	Site 300	H	58	Mature	Single	Good			
59	Site 300	H	59	Mature	Multiple	Good			
60	Site 300	H	60	Mature	Multiple	Good			
61	Site 300	H	61	Mature	Single	Good			
62	Site 300	H	62	Mature	Single	Poor			New growth at bottom
63	Site 300	H	63	Mature	Single	Good			
64	Site 300	H	64	Mature	Multiple	Poor			New growth at base, dead trunk
65	Site 300	H	65	Mature	Multiple	Good			
66	Site 300	H	66	Mature	Multiple	Good	1 exit hole		
67	Site 300	H	67	Mature	Single	Good			
68	Site 300	H	68	Mature	Multiple	Good			
69	Site 300	H	69	Mature	Multiple	Good			
70	Site 300	H	70	Mature	Multiple	Good			
71	Site 300	H	71	Mature	Single	Poor			
72	Site 300	H	72	Mature	Single	Poor			
73	Site 300	H	73	Mature	Single	Good			
74	Site 300	H	74	Mature	Multiple	Poor			
75	Site 300	H	75	Mature	Single	Good			
76	Site 300	H	76	Mature	Multiple	Good			
77	Site 300	H	77	Mature	Multiple	Good			
78	Site 300	H	78	Sapling	Multiple	Good			
79	Site 300	H	79	Mature	Single	Good			bent over
80	Site 300	H	80	Sapling	Single	Good			
81	Site 300	H	81	Mature	Multiple	Good			
82	Site 300	H	82	Mature	Multiple	Poor	1 exit hole		broken trunk

	A	B	C	D	E	F	G	H	I	J
	Seq. No.	LLNL or CDF&G	Area Plotted in Figures	Plant No. (new)	Growth Type	Trunk Type	Plant Health	Presence of VELB	LLNL Map Area	Notes
4	83	Site 300	H	83	Mature	Multiple	Good			
5	84	Site 300	H	84	Mature	Multiple	Good			
6	85	Site 300	H	85	Mature	Multiple	Good			
7	86	Site 300	H	86	Mature	Multiple	Poor			
8	87	Site 300	H	87	Sapling	Single	Good			
9	88	Site 300	H	88	Mature	Multiple	Good			
0	89	Site 300	H	89	Mature	Multiple	Good			
1	90	Site 300	H	90	Mature	Single	Poor			
2	91	Site 300	H	91	Mature	Multiple	Good			
3	92	Site 300	H	92	Mature	Multiple	Poor			
4	93	Site 300	H	93	Sapling	Multiple	Good			
5	94	Site 300	H	94	Sapling	Multiple	Good			
6	95	Site 300	H	95	Mature	Multiple	Good			
7	96	Site 300	H	96	Mature	Multiple	Poor			growth at base, otherwise dead
8	97	Site 300	H	97	Mature	Single	Poor			growth at base, otherwise dead
9	98	Site 300	H	98	Mature	Multiple	Good			
00	99	Site 300	H	99	Mature	Multiple	Good			
01	100	Site 300	H	100	Mature	Multiple	Good			
02	101	Site 300	H	101	Sapling	Single	Poor			
03	102	Site 300	H	102	Sapling	Multiple	Poor			
04	103	Site 300	H	103	Mature	Multiple	Poor			
05	104	Site 300	H	104	Mature	Multiple	Poor			
06	105	Site 300	H	105	Sapling	Multiple	Good			
07	106	Site 300	H	106	Mature	Multiple	Good			
08	107	Site 300	H	107	Mature	Multiple	Good			
09	108	Site 300	H	108	Mature	Multiple	Good			
10	109	Site 300	H	109	Mature	Single	Good			
11	110	Site 300	H	110	Mature	Multiple	Good			
12	111	Site 300	H	111	Mature	Multiple	Good			
13	112	Site 300	H	112	Mature	Multiple	Good			
14	113	Site 300	H	113	Mature	Multiple	Good			
15	114	Site 300	H	114	Mature	Multiple	Good			
16	115	Site 300	H	115	Mature	Multiple	Good			
17	116	Site 300	H	116	Mature	Multiple	Good	1 adult		
18	117	Site 300	H	117	Mature	Multiple	Good			
19	118	Site 300	H	118	Mature	Multiple	Good			
20	119	Site 300	H	119	Mature	Multiple	Good			
21	120	Site 300	H	120	Mature	Multiple	Good			
22	121	Site 300	H	121	Mature	Multiple	Good			
23	122	Site 300	H	122	Mature	Multiple	Good			
24	123	Site 300	H	123	Mature	Multiple	Good			

	A	B	C	D	E	F	G	H	I	J
	Seq. No.	LLNL or CDF&G	Area Plotted in Figures	Plant No. (new)	Growth Type	Trunk Type	Plant Health	Presence of VELB	LLNL Map Area	Notes
25	124	Site 300	H	124	Mature	Multiple	Good			
26	125	Site 300	H	125	Mature	Multiple	Good			
27	126	Site 300	H	126	Mature	Multiple	Good			
28	127	Site 300	H	127	Mature	Multiple	Good			
29	128	Site 300	H	128	Mature	Multiple	Good			
30	129	Site 300	H	129	Mature	Multiple	Good			
31	130	Site 300	H	130	Mature	Multiple	Good			
32	131	Site 300	H	131	Mature	Multiple	Good			
33	132	Site 300	H	132	Mature	Multiple	Good			
34	133	Site 300	H	133	Mature	Multiple	Good			
35	134	Site 300	H	134	Mature	Multiple	Good			
36	135	Site 300	H	135	Mature	Multiple	Good			
37	136	Site 300	H	136	Mature	Multiple	Good			
38	137	Site 300	H	137	Mature	Multiple	Good			
39	138	Site 300	H	138	Mature	Multiple	Good			
40	139	Site 300	H	139	Mature	Multiple	Good			
41	140	Site 300	H	140	Mature	Multiple	Good			
42	141	Site 300	H	141	Mature	Multiple	Good			
43	142	Site 300	H	142	Sapling	Single	Good			
44	143	Site 300	H	143	Mature	Multiple	Good			
45	144	Site 300	H	144	Sapling	Single	Good			
46	145	Site 300	H	145	Mature	Multiple	Good			
47	146	Site 300	H	146	Mature	Multiple	Good			
48	147	Site 300	H	147	Mature	Multiple	Good			
49	148	Site 300	H	316	Mature	Multiple	Good			
50	149	Site 300	H	317	Mature	Multiple	Good			
51	150	Site 300	H	318	Mature	Multiple	Good			
52	151	Site 300	H	319	Mature	Multiple	Good			
53	152	Site 300	H	320	Mature	Multiple	Good			
54	153	Site 300	H	321	Mature	Multiple	Good			
55	154	Site 300	H	322	Mature	Multiple	Good			
56	155	Site 300	H	323	Mature	Multiple	Good			
57	156	Site 300	H	324	Mature	Multiple	Good			
58	157	Site 300	H	325	Mature	Multiple	Good			
59	158	Site 300	H	326	Mature	Multiple	Good			
60	159	Site 300	H	327	Mature	Multiple	Good			
61	160	Site 300	H	328	Mature	Multiple	Good			
62	161	Site 300	H	329	Mature	Multiple	Good			
63	162	Site 300	H	330	Mature	Multiple	Good			
64	163	Site 300	H	331	Mature	Multiple	Good			
65	164	Site 300	H	332	Mature	Multiple	Good			

	A	B	C	D	E	F	G	H	I	J
	Seq. No.	LLNL or CDF&G	Area Plotted in Figures	Plant No. (new)	Growth Type	Trunk Type	Plant Health	Presence of VELB	LLNL Map Area	Notes
6	165	Site 300	H	333	Mature	Multiple	Good			
7	166	Site 300	H	334	Mature	Multiple	Good			
8	167	Site 300	H	335	Mature	Multiple	Good			
9	168	Site 300	H	336	Mature	Multiple	Good			
0	169	Site 300	H	337	Mature	Multiple	Good			
1	170	Site 300	H	338	Mature	Multiple	Good			
2	171	Site 300	H	148	Mature	Multiple	Good	1 adult		
3	172	Site 300	H	149	Mature	Multiple	Good			
4	173	Site 300	H	150	Mature	Multiple	Good			
5	174	Site 300	H	151	Mature	Multiple	Good			
6	175	Site 300	H	152	Mature	Multiple	Good	1 exit hole		
7	176	Site 300	H	153	Mature	Multiple	Good			
8	177	Site 300	H	154	Mature	Multiple	Good	1 adult		
9	178	Site 300	H	155	Mature	Multiple	Good			
0	179	Site 300	H	156	Mature	Multiple	Good	1 exit hole		
1	180	Site 300	H	157	Mature	Multiple	Good			
2	181	Site 300	H	158	Mature	Multiple	Good			
3	182	Site 300	H	159	Mature	Multiple	Good			
4	183	Site 300	H	160	Mature	Multiple	Good			
5	184	Site 300	H	161	Mature	Multiple	Good			
6	185	Site 300	H	162	Mature	Multiple	Good	1 exit hole		
7	186	Site 300	H	163	Mature	Multiple	Good			
8	187	Site 300	H	164	Mature	Multiple	Good			
9	188	Site 300	H	165	Mature	Multiple	Good			
0	189	Site 300	H	166	Mature	Multiple	Good			
1	190	Site 300	H	167	Mature	Multiple	Good			
2	191	Site 300	H	168	Mature	Multiple	Good	1 exit hole		
3	192	Site 300	H	169	Mature	Multiple	Good			
4	193	Site 300	H	170	Mature	Multiple	Good			
5	194	Site 300	H	171	Mature	Multiple	Good			
6	195	Site 300	H	172	Mature	Multiple	Good			
7	196	Site 300	H	173	Mature	Multiple	Good	1 exit hole		
8	197	Site 300	H	174	Mature	Multiple	Good			
9	198	Site 300	H	175	Mature	Multiple	Good			
0	199	Site 300	H	176	Mature	Multiple	Good			
1	200	Site 300	H	177	Mature	Multiple	Good			
2	201	Site 300	H	178	Mature	Multiple	Good			
3	202	Site 300	H	179	Mature	Multiple	Good	1 exit hole		
4	203	Site 300	H	180	Mature	Multiple	Good			
5	204	Site 300	H	181	Mature	Multiple	Good			
6	205	Site 300	H	182	Mature	Multiple	Good			

	A	B	C	D	E	F	G	H	I	J
	Seq. No.	LLNL or CDF&G	Area Plotted in Figures	Plant No. (new)	Growth Type	Trunk Type	Plant Health	Presence of VELB	LLNL Map Area	Notes
7	206	Site 300	H	183	Mature	Multiple	Good			
8	207	Site 300	H	184	Mature	Multiple	Good			
9	208	Site 300	H	185	Mature	Multiple	Good	1 exit hole		
10	209	Site 300	H	186	Mature	Multiple	Good			
11	210	Site 300	H	187	Mature	Multiple	Good			
12	211	Site 300	H	188	Mature	Multiple	Good			
13	212	Site 300	H	189	Mature	Multiple	Good	1 exit hole		
14	213	Site 300	H	190	Mature	Multiple	Good			
15	214	Site 300	H	191	Mature	Multiple	Good			
16	215	Site 300	H	192	Mature	Multiple	Good			
17	216	Site 300	H	193	Mature	Multiple	Good			
18	217	Site 300	H	194	Mature	Multiple	Poor			Deer browse heavy
19	218	Site 300	H	195	Mature	Multiple	Poor			Mostly dead
20	219	Site 300	H	196	Mature	Multiple	Poor			Mostly dead
21	220	Site 300	H	197	Mature	Multiple	Good			
22	221	Site 300	H	198	Mature	Multiple	Good			
23	222	Site 300	H	199	Mature	Multiple	Good			
24	223	Site 300	B	200	Mature	Multiple	Good			
25	224	Site 300	B	201	Mature	Multiple	Good			
26	225	Site 300	E	202	Mature	Multiple	Good		Lower	1 large 15" trunk & several smaller diameter stems
27	226	Site 300	E	203	Sapling	Multiple	Good		restricted area	5 stems
28	227	CDFG	F	204	Mature	Multiple	Good	1 exit hole	CDFG	
29	228	CDFG	F	205	Mature	Multiple	Good			
30	229	CDFG	F	206	Sapling	Single	Good			
31	230	CDFG	F	207	Mature	Multiple	Good			
32	231	CDFG	F	208	Sapling	Single	Good			
33	232	CDFG	F	209	Mature	Multiple	Good			
34	233	CDFG	F	210	Mature	Multiple	Good			
35	234	CDFG	F	211	Mature	Multiple	Good			
36	235	CDFG	F	212	Mature	Multiple	Good			
37	236	CDFG	F	213	Mature	Multiple	Good			
38	237	CDFG	F	214	Mature	Single	Good			
39	238	CDFG	F	215	Mature	Single	Good			
40	239	CDFG	F	216	Mature	Multiple	Good			
41	240	CDFG	F	217	Mature	Multiple	Good			
42	241	CDFG	F	218	Mature	Multiple	Good			
43	242	CDFG	F	219	Mature	Multiple	Good			
44	243	CDFG	F	220	Mature	Multiple	Good			
45	244	CDFG	F	221	Mature	Single	Good			
46	245	CDFG	F	222	Mature	Multiple	Good			
47	246	CDFG	F	223	Mature	Multiple	Good			

	A	B	C	D	E	F	G	H	I	J
	Seq. No.	LLNL or CDF&G	Area Plotted in Figures	Plant No. (new)	Growth Type	Trunk Type	Plant Health	Presence of VELB	LLNL Map Area	Notes
8	247	CDFG	F	224	Mature	Multiple	Good			
9	248	CDFG	F	225	Mature	Single	Good			
0	249	CDFG	F	226	Mature	Multiple	Good			
1	250	CDFG	F	227	Mature	Multiple	Good			
2	251	CDFG	F	228	Mature	Multiple	Good			
3	252	CDFG	F	229	Mature	Multiple	Good			
4	253	CDFG	F	230	Mature	Multiple	Good			
5	254	CDFG	F	231	Mature	Multiple	Good			
6	255	CDFG	F	232	Sapling	Multiple	Good	1 exit hole		
7	256	CDFG	F	233	Mature	Multiple	Good			
8	257	CDFG	F	234	Mature	Multiple	Good	1 exit hole		
9	258	CDFG	F	235	Mature	Multiple	Good	1 exit hole		
0	259	CDFG	F	236	Mature	Multiple	Good			8 ft upslope from #32
1	260	CDFG	F	237	Mature	Single	Good			
2	261	CDFG	F	238	Mature	Multiple	Good			Several large diameter stemmed elderberries with younger shoots
3	262	CDFG	F	239	Mature	Multiple	Good			
4	263	CDFG	F	240	Mature	Multiple	Good			
5	264	CDFG	F	241	Mature	Multiple	Good			
6	265	CDFG	F	242	Mature	Multiple	Good			
7	266	CDFG	F	243	Mature	Single	Good			
8	267	CDFG	F	244	Mature	Multiple	Good			
9	268	CDFG	F	245	Mature	Single	Good			2 dead elderberry upslope
0	269	CDFG	F	246	Mature	Multiple	Good			
1	270	CDFG	F	247	Mature	Multiple	Good			1 dead in addition to live one
2	271	CDFG	F	248	Mature	Multiple	Good	1 exit hole		
3	272	CDFG	F	249	Mature	Multiple	Good			Some fire damage (from 1984?)
4	273	CDFG	F	250	Mature	Multiple	Good			
5	274	CDFG	F	251	Mature	Multiple	Good			
6	275	CDFG	F	252	Mature	Multiple	Good			
7	276	CDFG	F	253	Mature	Multiple	Good			
8	277	CDFG	F	254	Mature	Multiple	Good			
9	278	CDFG	F	255	Mature	Single	Good			
0	279	CDFG	F	256	Mature	Multiple	Good			This and earlier ones all upslope of creek above dirt road
1	280	Site 300	A	294	Sapling	Multiple	Good		West side	E facing upslope of fire road, deer browsed
2	281	Site 300	A	295	Mature	Multiple	Good		West side	
3	282	Site 300	A	296	Mature	Multiple	Good			
4	283	Site 300	A	297	Mature	Multiple	Good			
5	284	Site 300	A	298	Mature	Multiple	Good			
6	285	Site 300	A	299	Mature	Multiple	Good			
7	286	Site 300	A	300	Mature	Multiple	Good			
8	287	Site 300	A	301	Mature	Single	Poor			

A	B	C	D	E	F	G	H	I	J
Seq. No.	LLNL or CDF&G	Area Plotted in Figures	Plant No. (new)	Growth Type	Trunk Type	Plant Health	Presence of VELB	LLNL Map Area	Notes
288	Site 300	A	302	Mature	Single	Poor			
289	Site 300	A	303	Mature	Single	Poor			
290	Site 300	A	304	Mature	Multiple	Good			
291	Site 300	A	305	Mature	Single	Good			
292	Site 300	A	306	Mature	Multiple	Good			
293	Site 300	A	307	Mature	Multiple	Good			
294	Site 300	A	308	Mature	Single	Good			
295	Site 300	A	309	Mature	Single	Good			
296	Site 300	A	310	Mature	Multiple	Good			
297	Site 300	A	311	Mature	Single	Good			
298	Site 300	A	312	Mature	Multiple	Good			
299	Site 300	A	313	Mature	Multiple	Good			
300	Site 300	A	314	Mature	Multiple	Good			
301	Site 300	A	315	Mature	Multiple	Good			
302	CDFG	F	257	Mature	Multiple	Good		CDFG	This and following ones below road alongside drainage
303	CDFG	F	258	Mature	Multiple	Good			
304	CDFG	F	259	Mature	Multiple	Good			
305	CDFG	F	260	Mature	Single	Good			
306	CDFG	F	261	Mature	Single	Good			
307	CDFG	F	262	Mature	Single	Good			6 ft downslope of #5
308	CDFG	F	263	Mature	Multiple	Good			Along road "curb"
309	CDFG	F	264	Mature	Single	Good			
310	CDFG	F	265	Mature	Multiple	Good			In drainage channel
311	CDFG	F	266	Mature	Multiple	Good			14-15" in diameter
312	CDFG	F	267	Sapling	Multiple	Good			
313	CDFG	F	268	Sapling	Single	Good			Several pruned stems alongside road
314	CDFG	F	269	Sapling	Single	Good			
315	CDFG	F	270	Mature	Single	Good			
316	CDFG	F	271	Mature	Single	Good			
317	CDFG	F	272	Mature	Multiple	Good			
318	CDFG	F	273	Mature	Single	Good			
319	CDFG	F	274	Mature	Single	Good			
320	CDFG	F	275	Mature	Single	Good			
321	CDFG	F	276	Mature	Multiple	Good		CDFG	Alongside road on drainage side
322	CDFG	F	277	Mature	Multiple	Good			
323	CDFG	F	278	Mature	Multiple	Good			
324	CDFG	F	279	Mature	Multiple	Good			
325	CDFG	F	280	Mature	Multiple	Good			
326	CDFG	F	281	Mature	Multiple	Good	1 exit hole		
327	CDFG	F	282	Sapling	Multiple	Good			
328	CDFG	F	283	Sapling	Multiple	Good			

	A	B	C	D	E	F	G	H	I	J
	Seq. No.	LLNL or CDF&G	Area Plotted in Figures	Plant No. (new)	Growth Type	Trunk Type	Plant Health	Presence of VELB	LLNL Map Area	Notes
0	329	CDFG	F	284	Mature	Single	Good			
1	330	CDFG	F	285	Mature	Multiple	Good			
2	331	CDFG	F	286	Mature	Single	Good			
3	332	CDFG	G	287	Mature	Multiple	Good		CDFG	
4	333	CDFG	G	288	Mature	Multiple	Good			
5	334	CDFG	G	289	Mature	Multiple	Good			
6	335	CDFG	G	290	Mature	Multiple	Good			
7	336	CDFG	G	291	Mature	Multiple	Good			
8	337	CDFG	G	292	Mature	Multiple	Good			
9	338	CDFG	G	293	Mature	Multiple	Good			
0										
1		Site 300		248						
2		CDFG		90						
3		Total		338						