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Cultural Landscapes Program

DETERMINATION OF ELIGIBILITY, CONDITION ASSESSMENT AND STABILIZATION PLAN
FOR
SONOMA DEVELOPMENTAL CENTER ORCHARD
AT JACK LONDON STATE HISTORIC PARK

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MARCH 2007

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[1] USDA Pomological Watercolor Collection," < http://www.ars-grin.gov/cor/pwc.html> October 12, 2006.

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PROJECT BACKGROUND

In 2002, the Jack London State Historic Park acquired 600 acres of property from the Sonoma Developmental Center (SDC) in Eldrige, Sonoma County, California. As a result of the adjacent land transfer, California State Parks obtained a large fruit orchard, which had been originally planted and maintained by the SDC, formerly the Sonoma State Hospital, since 1908. Closed by the hospital in 1966, the orchard was maintained by permitted lessees for several years until its eventual abandonment. Today, the orchard is in poor condition and needs immediate stabilization to prevent its loss.

In 2006, California State Parks contracted with the National Park Service, Pacific West Region (NPS PWR) Division of Cultural Resources through a Memorandum of Agreement to provide the following services for the historic orchard at Jack London State Historic Park: a Determination of Eligibility, a Condition Assessment and a Stabilization Plan. These three parts are combined in this final document. Historical research for the Determination of Eligibility was performed between September and December, 2006, with the use of the following repositories and information centers:

- California State Archives, Sacramento
- California State Library, Sacramento
- Sonoma Developmental Center Library
- Santa Rosa Central Library, Local History and Genealogy Annex
- Sonoma Valley Ecology Center
- Sonoma County Planning and Land Use Departments
- Jack London State Historic Park
- California State Parks, Diablo Vista Office

Field work for the Condition Assessment was conducted between August and October 2006 using Global Positioning Systems to locate each orchard tree. An assessment of the condition of each fruit tree and the health problems within each species was made and the results are provided in this document. The Stabilization Plan provides guidance to prevent the further deterioration of the orchard, based on the philosophy of the *Secretary of the Interior's Standards for the Treatment of Historic Properties*. The Stabilization Plan includes a description of recommended procedures and a schedule of implementation.

PART I:

DETERMINATION OF ELIGIBILITY (DOE)

EXECUTIVE SUMMARY

The Sonoma Developmental Center Orchard at Jack London State Historic Park has a rich history that began in the early part of the 20th-century. Planted between 1908 and 1912 by the Sonoma State Home on the hills behind the hospital grounds, nearly 100 acres of orchards, comprising of approximately 60 acres of fruit trees in the upper orchard and nearly 40 acres in the lower, were maintained by patients and employees from the 1910s through the mid 1960s. During this period of development, the orchards served as a primary means of sustenance for hospital patients. The orchards, together with the hospital piggery, dairy farm, poultry house and vegetable garden allowed the institution to remain virtually self-sufficient for several decades. As patient population and demographics changed in the early 1960s, the hospital, which eventually became the Sonoma Developmental Center, was no longer able to maintain the orchards. Subsequently, the orchards were leased to private parties and later abandoned. In 2002, the historic orchards were added to the Jack London State Historic Park, near Eldridge, California.

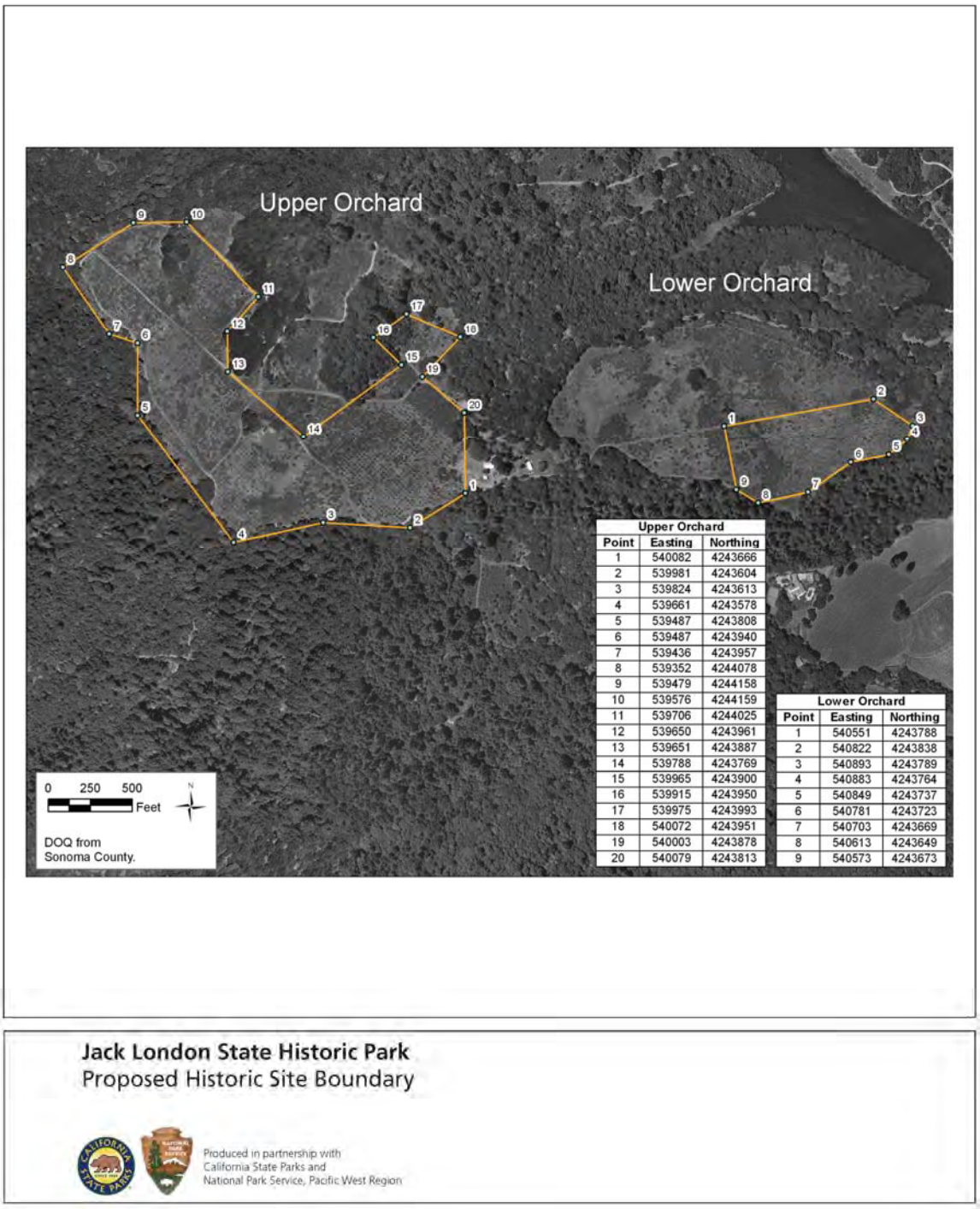
The orchards are significant for their association with the development of state hospital farms in California. Additionally, the orchards are significant as an excellent example of pre-World War II horticultural practices that are archaic today. Today, nearly 21-acres of apple, apricot, cherry, pear, plum, prune and quince trees are extant in the upper orchards and 5.5 acres of plums are present in the lower orchard. Additionally, 52-acres remain as cleared land in the upper orchard, while 32-acres of cleared land remain associated with the lower orchard, out of approximately 100 total acres historically. Reflecting the spatial organization, circulation, land use, vegetation and the natural systems and features that were developed during the period of significance, 1908-1957, the orchard and associated fruit trees possess significance and integrity.

BOUNDARY DESCRIPTION

The Sonoma Developmental Center Orchard at Jack London State Historic Park is composed of the Coon Trap (upper) orchard and the lower orchard. The Sonoma Developmental Center (SDC) retains ownership of approximately 65 European plum trees in the southeast corner of the lower orchard and continues to own Camp Via, a centrally-located node of development between the upper and lower orchards. Camp Via was historically associated with the maintenance and development of the orchards. Today, the SDC uses Camp Via as a day retreat center for its patients. Historically, the upper and lower orchards covered approximately 100 acres, however since the 1960s acreage has been lost due to absence of maintenance. Today, the recommended historic site boundary of Sonoma Developmental Center Orchard at Jack London State Historic Park encompasses 57.5 acres. The boundary is discontiguous and contains 52 acres in the upper orchard and 5.5 acres in the lower orchard. The historic site boundary is defined by the UTM coordinates in the following table and is illustrated in Figure 1, "Boundary Map".

Upper Orchard			Lower Orchard		
Point	Easting	Northing	Point	Easting	Northing
1	540082	4243666	1	540551	4243788
2	539981	4243604	2	540822	4243838
3	539824	4243613	3	540893	4243789
4	539661	4243578	4	540883	4243764
5	539487	4243808	5	540849	4243737
6	539487	4243940	6	540781	4243723
7	539436	4243957	7	540703	4243669
8	539352	4244078	8	540613	4243649
9	539479	4244158	9	540573	4243673
10	539576	4244159			
11	539706	4244025			
12	539650	4243961			
13	539651	4243887			
14	539788	4243769			
15	539965	4243900			
16	539915	4243950			
17	539975	4243993			
18	540072	4243951			
19	540003	4243878			
20	540079	4243813			

Table 1: UTM boundary coordinates of the proposed Sonoma Developmental Center Orchard Historic Site at Jack London State Historic Park.



Upper Orchard		
Point	Easting	Northing
1	540082	4243666
2	539981	4243604
3	539824	4243613
4	539661	4243578
5	539487	4243808
6	539487	4243940
7	539436	4243957
8	539352	4244078
9	539479	4244158
10	539576	4244159
11	539706	4244025
12	539650	4243961
13	539651	4243887
14	539788	4243769
15	539965	4243900
16	539915	4243950
17	539975	4243993
18	540072	4243951
19	540003	4243878
20	540079	4243813

Lower Orchard		
Point	Easting	Northing
1	540551	4243788
2	540822	4243838
3	540893	4243789
4	540883	4243764
5	540849	4243737
6	540781	4243723
7	540703	4243669
8	540613	4243649
9	540573	4243673

Figure 1: Boundary map of the proposed Sonoma Developmental Center Orchard Historic Site.

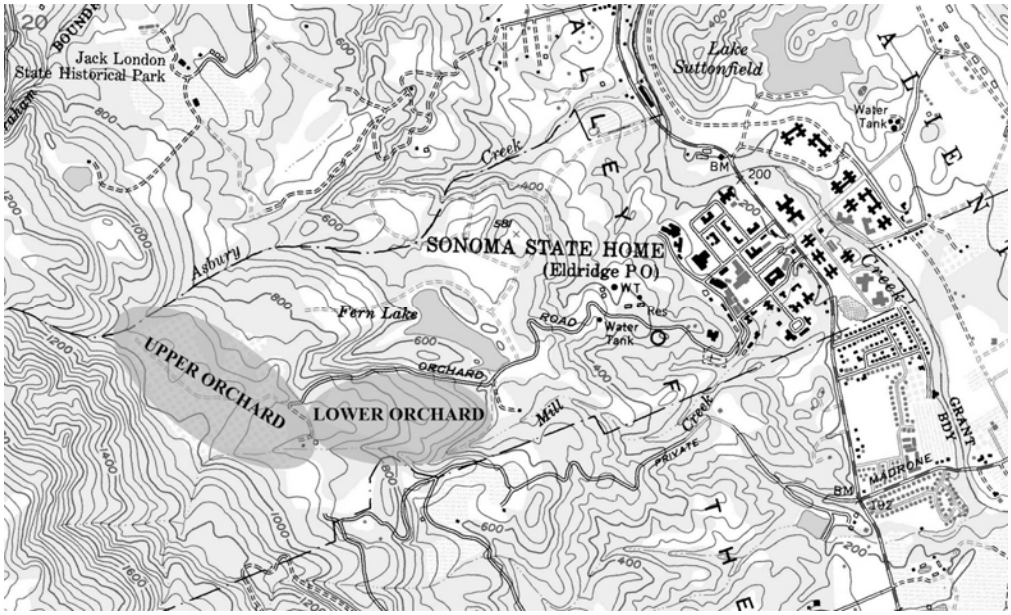


Figure 2: Topographic map showing the location of the Sonoma Developmental Center Orchard (upper and lower) at Jack London State Historic Park, USGS, photo revised, 1980.

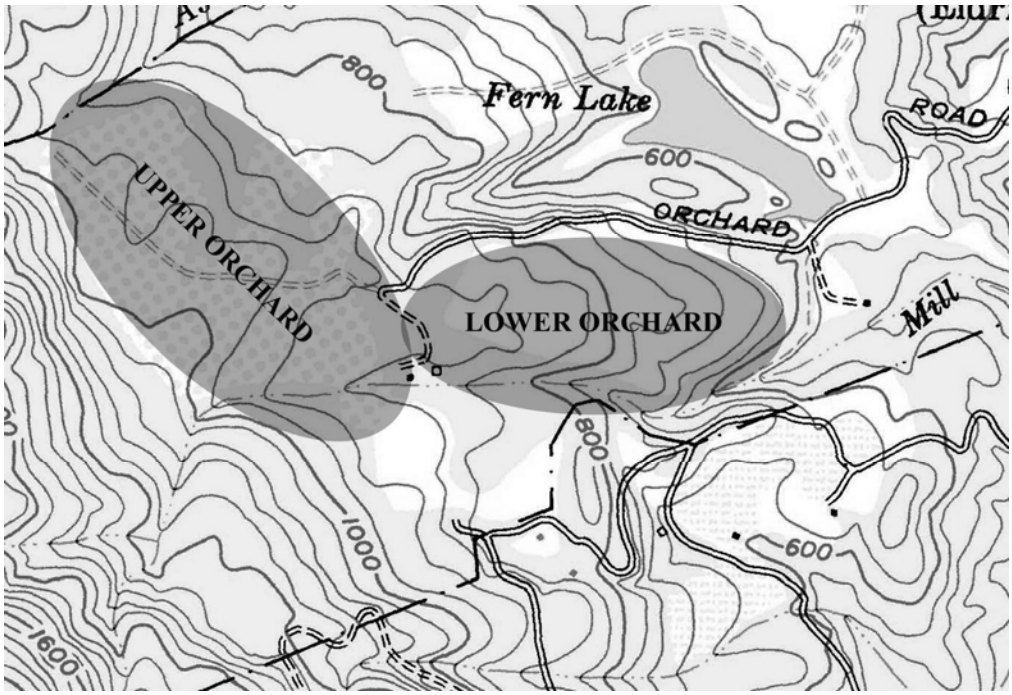


Figure 3: Close-up view of the location of the Sonoma Developmental Center Orchard (upper and lower), USGS, photo-revised, 1980.

STATEMENT OF SIGNIFICANCE

The Sonoma Developmental Center Orchard is a 57.5-acre historic site located within the boundaries of the Jack London State Historic Park, near Eldridge, California. Acquired by California State Parks in 2002, the orchard has a rich history associated with the development of the Sonoma Developmental Center (SDC), formerly known as the California Home for the Care and Training of Feeble-Minded Children and later the Sonoma State Home and Sonoma State Hospital. The Sonoma Developmental Center Orchard is significant at the state level under criterion A for its association with the development of state hospital farms in California. Additionally, the orchard is significant under criterion C as a fine example of an intact, pre-World War II orchard landscape. The period of significance spans the years 1908-1957, reflecting the period of intensive orchard cultivation by hospital patients and employees. Significant as a unique expression of a state hospital orchard, this landscape reflects larger social trends such as patients as laborers and self-sustaining hospital communities. The Sonoma Developmental Center Orchard is also significant as one of the few remaining pre-World War II state hospital orchards in California.

Located on the hills behind the SDC hospitals grounds near Mount Sonoma, apple, apricot, cherry, peach, pear, plum and quince trees were planted between 1908 and 1912. The hospital also maintained a farm, which included dairy cattle, hogs and poultry. Similarly, hay and vegetable crops were also grown on the hospital grounds during this period. The period of significance for the orchard began in 1908, when several acres of fruit trees were planted on two cleared tracts of land, located behind the hospital. The period extends to 1957 when the orchard began to decline due to significant changes associated with the shifting mental healthcare system. Ultimately, the period of significance reflects an integral period of development in which the hospital experienced a series of dramatic changes in population numbers and demographics.

Created as a home for children with developmental disabilities in 1891, the institution began accepting people of all ages with disabilities by the end of the 19th-century. As the number of patients rapidly grew, the hospital farm and orchard increased in acreage. To maintain the farm and orchard operations, patients were often engaged in manual labor to keep operating costs down. Between 1910 and 1920, the hospital patient population grew by nearly 50%. At the same time, the hospital orchard was also rapidly growing. Peaking at approximately 4,000 patients in the 1940s, the institution had an extensive farm that provided meat, cheese, milk and eggs to patients. Furthermore, the vegetable gardens and orchard produced a plethora of fresh fruit and vegetables that were consumed fresh as well as canned and dried for future use.

By the end of the 1950s, the mental healthcare system in California began to undergo significant changes. During this period, it was acknowledged by hospital administrators that patients had rights and privileges and that manual labor without pay was not acceptable. Furthermore, at this time the creation of

community-based treatment options allowed patients who did not have severe disabilities, the ability to live outside of the institution. As a result, patient populations at the SDC began to decline as only those individuals with the most severe disabilities were admitted into the hospital. Due to these changes, hospital officials could no longer maintain the farm and orchard. By the mid to late 1960s, the orchard and the farm had been closed.

Criterion A

The creation of the California Home for the Care and Training of Feeble-Minded Children, now the SDC, played an important role in the early development of California's institutional healthcare system. Significantly, California was one of the first states west of the Mississippi River to create facilities to care for individuals with developmental disabilities.[2] In 1885, the California state legislature passed a bill, which established a home for the care and training of feeble-minded children. In addition, the legislature appropriated $25,000 to purchase a new property and $20,000 to support the home for two years.[3] In the same year, the Santa Clara home was developed to house children with disabilities. Immediately the home became overwhelmed with problems. It functioned for only a few years before it became too small to house the growing number of applicants. By 1889, new building sites were being considered by state officials.

The site of the California Home for the Care and Training of Feeble-Minded Children was selected in 1889. Situated on nearly 1,700 acres of land in a rural, isolated environment, the hospital had a natural water supply at its disposal and a railroad station adjacent to its boundaries. Often sites such as these were considered ideal for institutional development because they could sustain agricultural activities, which would allow the hospital to be self-sufficient. Furthermore, the isolated environment was considered essential in the continued recovery of patients. Interestingly, many mental healthcare experts at the time considered institutional environments like the grounds of the SDC, literally a Garden of Eden where patients could escape the stresses of everyday life and have the opportunity to live and work in a rural, pastoral setting.[4]

Following a series of institutional healthcare changes that were occurring across the nation, the SDC and several other California state hospitals were developed as "farm colonies" in the latter part of the 19th and

[2] National Register of Historic Places Nomination Form for the Sonoma State Home, Main Building, listed October 2000.
[3] "A Short History of Sonoma State Hospital," *Eldridge Gazette*, June 1980, 1.
[4] Robert B. Kugel and Wolf Wolfsenberger, eds., *Changing Patterns in Residential Services for the Mentally Retarded*, President's Committee on Mental Retardation, Washington D.C., January 10, 1969, 97.

early portions of the 20th-centuries.[5] Colonies such as these were intended to allow the institution to maintain itself as a self-sufficient and geographically isolated hospital community. By approximately 1910, the SDC had a well established farm that included dairy cattle, hogs, poultry, vegetable gardens and orchards on hospital grounds. Due to the accessibility of large tracts of land, many of the institutions that developed during this period tended to be significantly larger than hospitals constructed in earlier decades.[6] As a means to control and feed the large number of patients, hospital officials required patients, often referred to as inmates, to perform manual labor on the farm and orchards. Not only did this system help reduce operating costs, but it also served to keep the patients occupied. By the late 1950s, the concept of patients as laborers was no longer acceptable and as a result, work activities on the farm and in the orchards decreased. Occupational and industrial therapy programs allowed a small number of patients to continue working in the orchards; however, by the mid 1960s, these practices were largely abandoned.

Examples of farms and orchards associated with state hospitals can be found throughout the United States at the turn of the 20th-century, particularly on the eastern seaboard and in the Midwest. Much like the SDC, the Kalamazoo State Hospital in Michigan had an extensive orchard, which had been planted by private parties prior to 1874. In 1887, the orchard and associated property was purchased by the Kalamazoo State Hospital. Throughout the years, the orchard was maintained and improvements were made by hospital patients and employees. Reaching its peak in the 1930s, a large quantity of fruit was consumed fresh, while the cannery on the main hospital grounds preserved the remaining fruit for future use. Closed in 1969, the orchard was later used by Michigan State University as an experimental orchard for a short period of time.[7]

Numerous additional examples of institutional farm colonies exist. At the Spring Grove Hospital Center in Catonsville, Maryland, farming was the hospital's primary business at the turn of the 20th-century.[8] Similarly, the hospital in Eloise, Michigan had its own dairy, piggery and greenhouse, all of which were maintained by approximately 3,000 hospital patients.[9] Finally, Oregon State Hospital, Fairfield State Hospital in Connecticut and Warren State Hospital in Pennsylvania also had productive farms and orchards that allowed these institutions to remain largely self-sufficient.

[5] Ibid, 99, 119-122.
[6] Charles A. Kiesler and Amy E. Sibulkin, *Mental Hospitalization: Myths and Facts About a National Crisis*, (Newbury Park: Sage Publications, 1987), 30-31.
[7] Larry B. Massie, "Report of the Historic Use of the Property Commonly Known as the Kalamazoo State Hospital Colony Farm, the Michigan State University Agricultural Experiment Orchard and the Lee Baker Farm," February 9, 1991.
[8] "Spring Grove Hospital Center," <http://www.springgrove.com/history.html#The%20Nation's%20Second%20Oldest%20Psychiatric%20Hospital> November 29, 2006.
[9] "Elosie, Michigan: A Brief History," http://www.talesofeloise.com/history.html> November 29, 2006.

The Sonoma Developmental Center Orchard is one of the few remaining historic institutional agricultural landscapes in California. Historically, both the Napa State Hospital and the Metropolitan State Hospital in California followed a similar self-sustaining agricultural farm colony model. However, much like the SDC, these orchards and farms were closed in the 1960s as the mental healthcare system underwent a series of significant reforms. Today, many of these agricultural landscapes, both in California and across the nation have been lost, as the public institutional care for those with disabilities continues to decrease and hospitals are closed.

Criterion C

Significant as an excellent remaining example of a pre-World War II horticultural landscape, the Sonoma Developmental Center Orchard possesses the distinctive characteristics of a historic orchard. Planted in the early 20th-century, numerous heirloom fruit varieties and various species are represented in the orchard. Additionally, the orchard contains standard fruit trees grafted onto seedling rootstocks, which are 'low headed' and have a short trunk. Laid out on a standard grid system and pruned in an open-bowl style, these trees display all of the characteristics of pre-World War II orchard.

While the development of horticultural fruit crops began in California as early as the Spanish Mission Period, the intensive cultivation of fruit crops did not begin in the state until the late 19th-century. [10] Sources estimate that there were approximately four million apple, apricot, peach, pear and plum trees in California in 1880. Twenty years later, in 1900, there were more than 27 million fruit trees in the state. This dramatic increase in fruit tree numbers occurred as a result of a number of factors, which included an increased available workforce, the development of irrigation technology and better transportation systems.

By the 1920s there was an increased optimism in the development of horticulture in California, marked by rapid development. During the period from 1919-1929, the number of acres devoted to grape crops increased by 94 percent. Similarly, at this time, subtropical fruit and nut acreages increased by 82 percent, while vegetable acreages increased by 91 percent and temperate-zone fruits increased by 63 percent. [11] Throughout the years, California's fruit and nut industry has remained viable and increasingly dynamic.

[10] David C. Flaherty and Sue Ellen Harvey, *Fruits and Berries of the Pacific Northwest* (Alaska Northwest Publishing Company, 1988), 65. And "A Stylized History of California Agriculture from 1769 to 2000," in the new Giannini Foundation Special Report 04-1, *Whither California Agriculture: Up, Down, or Out? Some Thoughts about the Future.*

[11] "A Stylized History of California Agriculture from 1769 to 2000," from the new Giannini Foundation Special Report 04-1, *Whither California Agriculture: Up, Down, or Out? Some Thoughts about the Future.*

Today, the industry is marked by intensive, specialized crops. Defined by diversification, more than 350 different crops were grown in California in the year 2000.[12]

Comparable to statewide trends, horticulture in Sonoma County remained dynamic and ever-changing throughout the years. In 1868, over 200,000 acres of land were under cultivation in Sonoma County. During this time, the Pomological Society reported that 561 varieties of fruit were approved for planting in the locale, which included 178 varieties of apples, 122 varieties of pears, 55 varieties of peaches, 43 varieties of cherries, 33 varieties of plums and 11 apricot varieties.[13] By the late 1800s, a large portion of the Sonoma Valley had been planted with vine crops. However, during this period, many horticulturalists were removing their vineyards due to falling grape prices. In many cases, the vineyards were replaced with fruit trees, hay and grain crops.[14] These crops remained viable for several decades; however, today the landscape is once again characterized by vineyards in many portions of the Sonoma Valley.

The California Home for the Care and Training of Feeble-Minded Children, which became known as the SDC, was established in 1891 during the period in which Sonoma County's horticulturalists were experiencing a shift away from the cultivation of vineyards towards the production of fruit and nut crops. Representative of the times, from 1908 to 1912, a significant acreage of fruit trees were planted behind the home. Reflecting the desire to maintain a self-sufficient hospital community, many species of fruit trees were planted to serve as a subsistence base for the home's patients. Represented species included several popular 19th-century varieties of apple as well as apricot, cherry, peach, pear, plum and quince.

Defined by multiple species on seedling rootstocks pruned in an open-bowl style and laid out on a standard grid system, the Sonoma Developmental Center Orchard exhibits the characteristics of an intact pre-World War II fruit orchard. Planted in the first and second decades of the 20th-century, approximately 140 acres of orchards were planted on the grounds around the institution. The fruit trees were laid out by blocks of species, which were separated by a network of two-track roads and several larger truck roads. The apple and pear orchard areas were planted at 30 feet by 30-feet square spacing, which was typical for the largest orchard species on seedling rootstocks at the time. The other species, such as the apricots, plums and prunes, were planted at 22 feet by 22-feet square spacing and generally laid out perpendicular to the bordering road, which allowed for vehicular access to the orchards for maintenance and cultivation purposes.

[12] Ibid.
[13] Titus Fey Cronise, *The Natural Wealth of California* (San Francisco: H.H. Bancroft and Company, 1868), 362-363.
[14] Becky Goehring, "Rich soil and mild climate—an ideal farming atmosphere," *Sonoma Index-Tribune*, 100 years edition, July 1979.

The form and variety of the fruit trees was typical of their period in American horticultural history. Each fruit tree variety was grafted to a seedling rootstock, which produced a full-sized or standard fruit tree. Accordingly, each fruit tree in the orchard grew to a characteristically large size for the period. As such, the large fruit trees required wide spacing and intensive pruning to control them. Also typical of early 20th-century horticultural practices was the formation of fruit trees with a 'low-head' or short trunk, just 18-30" tall, and an open-bowl pruning style, which is demonstrated in the Sonoma Developmental Center Orchard. Ten varieties of apples are represented in the orchard, which include: the Alexander, Delicious (Hawkeye), Esopus Spitzenburg, Gravenstein, Jonathan, Newtown Pippin, Northern Spy, Rhode Island Greening, Winesap, Yellow Bellflower and Yellow Transparent varieties. Additionally, two varieties of pears, Bartlett and Comice, were discovered and more are likely, though not identifiable in this project (the trees were not bearing fruit). Many of these varieties were typically found in California apple and pear orchards dating from this period. Furthermore, other species and varieties of fruit exist in the orchards. While variety identification was difficult without fruit on the tree, it is likely that the Moorpark or Blenheim varieties of apricot are represented in the orchard. It also likely that the cherry trees are of the Bing or Black Tartarian variety. Finally, both European plums and Damson plums are found in the orchards. The prune trees are of the "French" or "Italian" varieties.

Before the creation of the United States Department of Agriculture in the late 1870s, orchards were largely un-pruned in America. Orchard trees had a wilder or forest-like appearance, with tall trunks, often more than six-feet tall, as lower limbs were browsed off by livestock or wildlife. After 1880, the USDA fostered a scientifically educated generation of orchardists, and promoted the use of the low-headed trunk to reduce the height of the tree canopy, and to stimulate trees to fruit when younger. The use of pruning to develop an overall style was also promoted, using either the "open-bowl style" or the "central leader style." This pruning style allowed more light to enter the tree canopy, and increased the color, size and quality of fruit. As a result, American orchards were transformed from unruly tree plantations with tall trunks, to highly ordered, geometric plantations of stylistically pruned trees with short trunks.

Most orchards planted between 1880 and the end of World War II displayed the characteristic appearance of the Sonoma Developmental Center Orchard. After this time, seedling rootstocks were substituted by clonal (or cloned) dwarfing rootstocks, and many 19th-century varieties were abandoned. As a result, orchards of the later 20th-century were composed of shorter trees, tighter tree spacing, taller trunks (to prevent the weaker limbs of dwarf trees touching the ground when laden with fruit), and a monoculture of very few varieties. In the 21st-century, newly planted apple orchards use dwarf trees planted at 1,000 to 2,000 trees per acre, rather than 40 trees per acre, as in the Sonoma Developmental Center Orchard. The Sonoma Developmental Center Orchard is a period orchard displaying horticultural practices that are now considered uneconomical and archaic.

Significantly, the land use, spatial organization, circulation routes and vegetation associated with the Sonoma Developmental Center Orchard continue to echo the original orchard layout. Today, many of the initial blocks of fruit species are still extant and continue to function as species orchards. Similarly, many of the original primary as well as secondary two-track roads are still in existence. Orchard Road remains the primary route from the main hospital grounds to the orchards. While several blocks of trees have died over the years, especially the short-lived peaches, the overall organization of the orchards and roads remains unchanged. In addition, the vegetation remains largely intact, with a majority of the original fruit species still represented in the orchard. Finally, the natural systems and features associated with the Sonoma Developmental Center Orchard remain similar to those conditions which affected the sustained maintenance and development of the orchard through time. In particular, several small springs and streams still remain as viable groundwater sources in the area.

Today the Sonoma Developmental Center Orchard remains largely intact; however, many of the trees are in poor condition and are quickly deteriorating. Nearly 21-acres of apple, apricot, cherry, pear, plum, prune and quince trees are extant in the upper orchards and 5.5 acres of plums are present in the lower orchard. Additionally, 52-acres remain as cleared land in the upper orchard, while 32-acres of cleared land remain associated with the lower orchard, out of approximately 100 total acres historically. Despite the overall poor condition of the trees, the orchard retains integrity and serves as a fine example of a pre-World War II orchard landscape. Furthermore, the orchard reflects the spatial organization, circulation, land use, vegetation and the natural systems and features that it attained during the period of significance, 1908-1957.

PHYSICAL HISTORY

Early Land Ownership and Development

The land upon which the extant Sonoma Developmental Center Orchard is located has a rich history that began prior to the establishment of the State of California. Initially, this parcel of land was part of the Petaluma, Agua Caliente Grant that was given to General M.G. Vallejo by the Mexican Government in 1834.[15] Vallejo owned the property for only a short period of time before losing it as a result of shifting political ideologies. Several years later, circa 1848, records indicate that the Asbury family settled on a piece of land that was originally part of the land grant mentioned-above. This tract of property was bound by two creeks, known today as Asbury and Mill (Hill) Creeks. A sawmill was also constructed in the vicinity, suggesting that the area was being logged.[16] For unknown reasons, the Asbury family left the area after only a few years.

By 1867, William McPherson Hill had purchased a large acreage of property in Sonoma Township, totaling approximately 900 acres. It is likely that Hill's purchase included lands originally associated with the Petaluma, Agua Caliente Grant as well as the Asbury property. The following year, in 1868, it was reported that Hill had 35 acres of vineyards and 30,000 vines located on the west side of the valley.[17] As the years progressed, Hill continued to purchase land in the area and by 1877 he owned a total of 1,669 acres (see Figure 4). This property encompassed the area that would later become the Sonoma Developmental Center. During this period of development, Hill cultivated the land extensively. Agricultural Census records from 1880 indicate that Hill possessed 250 acres of tilled land, which included 100 acres of meadows and pastures as well as 150 acres of orchards and vineyards (see Figure 5). At this time, Hill had five acres of apples under cultivation that included 200 bearing trees that produced 1,000 bushels of fruit.

The majority of the Hill's cultivated acreage was planted as vineyards.[18] Hill owned the land until 1889, when he sold the property to the State of California. The large parcel of land, nearly 1,700 acres in size, was purchased for the development of an institution to care for disabled children (see Figure 6).[19]

[15] Gail Sifford, "Requiem for Angelestha Griggsby: Parent Hospital Association Historian," *Eldridge Gazette*, February 1980, 6.
[16] Arthur Dawson, Sonoma Developmental Center Chronology, n.d.
[17] Cronise, 165-175.
[18] Agricultural Census Records for William McPherson Hill property, Sonoma Township, Sonoma County, 1880.
[19] "Sonoma State Hospital first opened in 1891," *Sonoma Index-Tribune*, June 21, 1973.

California Home for the Care and Training of Feeble-Minded Children

As the population of the State of California continued to grow throughout the latter part of the 19th-century, there became an increasing number of children with disabilities who needed care. Disenchanted with the services available for their disabled children, Mrs. Henry Judah and Mrs. F.H. Bentley established the California Association for the Care and Training of Feeble Minded Children in 1883.[20] By the following year, the newly formed association succeeded in opening their first facility to house disabled children at White Sulpher Springs near Vallejo. Later, the home was moved to Alameda, California. Due to numerous problems associated with the facilities and their locations, the association was unable to maintain the institution without outside assistance. As a result, Mrs. Judah and Mrs. Bentley requested support from the California state legislature to assist in the operation of the facility.

In 1885, the legislature passed a bill which created a home for the care and training of feeble-minded children. In addition, the legislature appropriated $25,000 to purchase a new property and $20,000 to support the home for two years.[21] Significantly, the passage of this legislation made California one of the first states west of the Mississippi River to create facilities to care for individuals with developmental disabilities.[22] The new institution, funded by the state, was located on a 51-acre site in the town of Santa Clara. Opened in September 1885, the institution housed 20 patients. Unfortunately, it functioned for only a few years before it became too small to house the growing number of applicants. By 1889, new building sites were being considered by state officials.

As a result of the insufficient facilities available at the Santa Clara home, the state legislature appointed a commission to locate a site for a new hospital facility. Captain Oliver Eldridge and George B. Gibbs were appointed to perform this task. After assessing more than 100 parcels of land, they chose the William McPherson Hill property as the new location for the home. In 1890, 12 children were transported from the overcrowded Santa Clara facility to the newly acquired site. At this time, the children were housed in the extant Hill farmhouse, located near the new town of Eldridge. Shortly after, three small buildings were constructed to house the epileptic patients, the kitchen and the laundry.[23] By November 24, 1891, the new facility, named the California Home for the Care and Training of Feeble-Minded Children, opened its doors accepting 148 patients.

[20] Sonoma Developmental Center, "History of Sonoma Developmental Center," <http://www.dds.ca.gov/sonoma/sonoma_History.cfm> October 10, 2006.
[21] "A Short History of Sonoma State Hospital," *Eldridge Gazette*, June 1980, 1.
[22] National Register Nomination Form for the Sonoma State Home, 2000.
[23] "Sonoma State Hospital Established in 1889 on the Former Hill Ranch," *Sonoma Index-Tribune*, 100 years edition, July 1979.

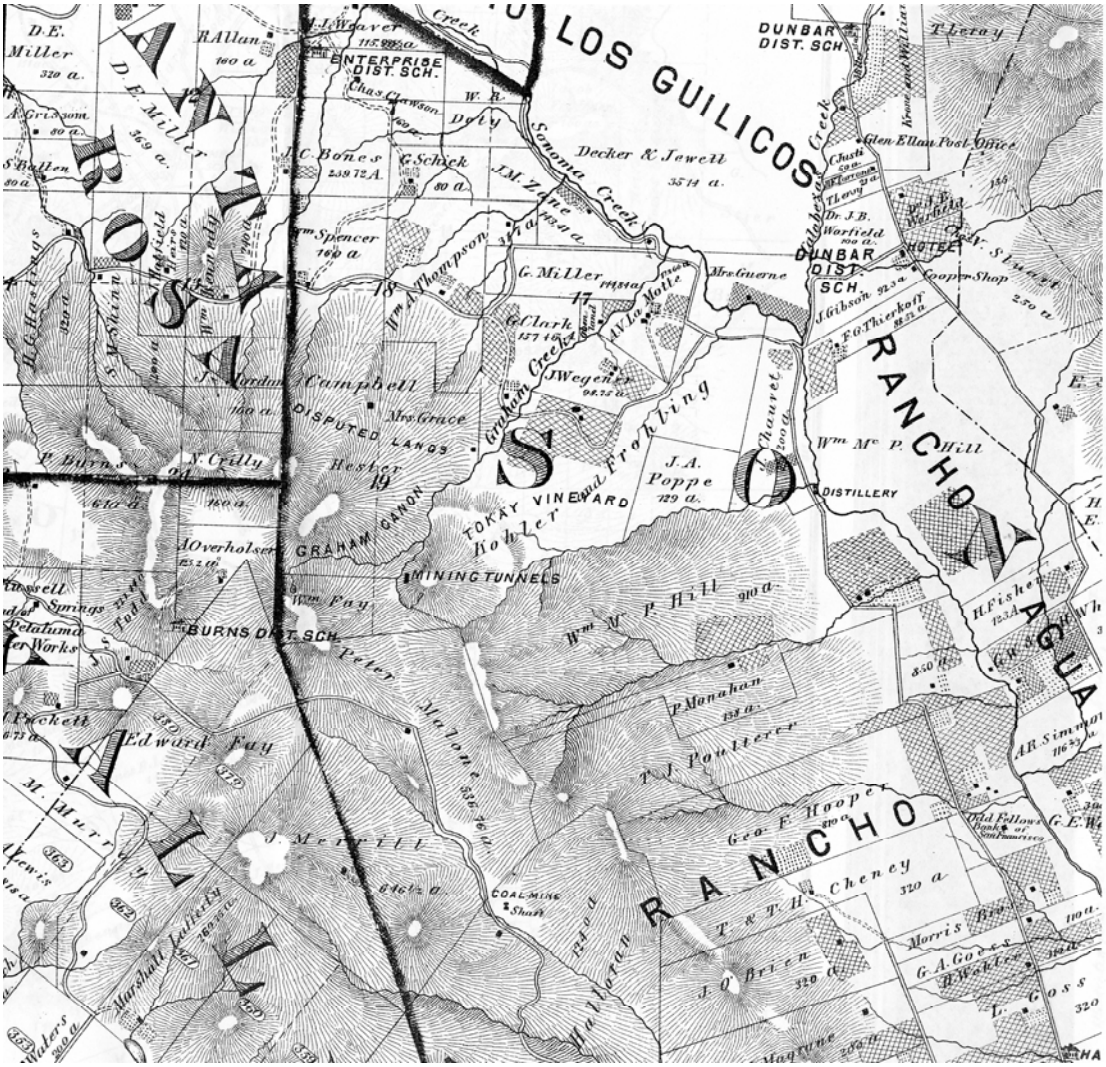


Figure 4: Historic map illustrating the boundaries of the William McPherson Hill property in 1877 (*Thompson*).

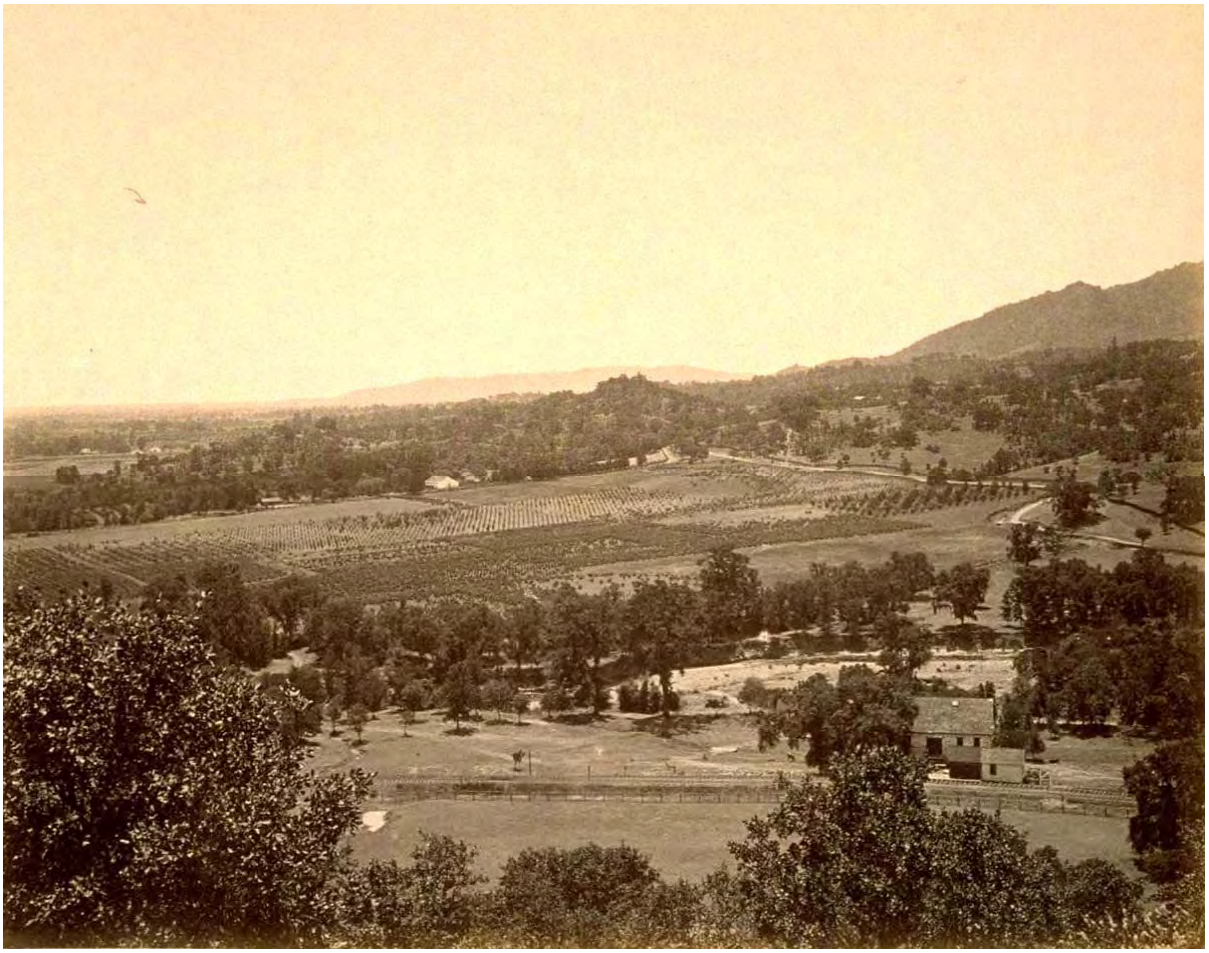


Figure 5: Historic photograph of the William McPherson Hill vineyard, circa 1880s. Note the extensive acreage of land under cultivation *(Bancroft Library, University of California-Berkeley*).

As a result of the insufficient facilities available at the Santa Clara home, the state legislature appointed a commission to locate a site for a new hospital facility. Captain Oliver Eldridge and George B. Gibbs were appointed to perform this task. After assessing more than 100 parcels of land, they chose the William McPherson Hill property as the new location for the home. In 1890, 12 children were transported from the overcrowded Santa Clara facility to the newly acquired site. At this time, the children were housed in the extant Hill farmhouse, located near the new town of Eldridge. Shortly after, three small buildings were constructed to house the epileptic patients, the kitchen and the laundry.[24] By November 24, 1891, the new facility, named the California Home for the Care and Training of Feeble-Minded Children, opened its doors accepting 148 patients.

[24] "Sonoma State Hospital Established in 1889 on the Former Hill Ranch," *Sonoma Index-Tribune*, 100 years edition, July 1979.

Intended to educate and train mentally disabled children, the ultimate goal of the institution was "to fit them, as far as possible, for future usefulness." [25] Following these tenets, the superintendent of the institution stressed the value of education and productivity within the home. Not surprisingly, the net result was an institution managed under the principals of self-sufficiency, which also allowed the institution to remain relatively isolated from surrounding communities. This relative isolation was considered an important component in the rehabilitation of patients. Additionally, by creating a self-sufficient community, the institution would ease the financial burden of the home from state taxpayers. As a result, the patients, who were also referred to as inmates, participated in the everyday working activities associated with the institution, which included tending the orchard, farming, gardening, laundry and kitchen duties as well as general grounds maintenance. [26] This idea was followed from as early as 1892, when the children at the facility played an important role in institutional operations, which included daily "chores" such as farm work, cooking and serving food.[27]

Development of Farm, Gardens and Orchards

By the end of the 19th-century, the California Home for the Care and Training of Feeble-Minded Children began accepting people of all ages with disabilities.[28] By 1899, the hospital reported a total of 540 patients receiving care in the facility. [29] As inmate populations continued to grow, the hospital needed increased supplies to support it. As a result, the orchards and associated farm and gardens were enlarged to meet demands. Due to the admittance of adults, the institution was able to utilize a larger and more experienced workforce, which allowed the home to continue increasing the acreage under cultivation. These practices also allowed for the continuation of self-sufficiency. Justifying that manual labor was good for the patients; many inmates were put to work on hospital grounds without receiving pay. At this time, the institution's superintendent noted that: "The extensive lands offer a field for open-air work and will enable appropriate cases to benefit themselves by light and pleasurable employment." [30]

Less than 15 years after the establishment of the home, the State Commission in Lunacy reported that the institution had 114 acres in orchard and vineyard, as well as 285 acres in hay and 14 acres of vegetable

[25] Wendy Kline, *Building a Better Race: Gender, Sexuality, and Eugenics from the Turn of the Century to the Baby Boom* (Berkeley: University of California Press, 2001), 35.
[26] Ibid.
[27] John Erickson and Yvonne Downs, "Education—a common thread from then 'til now," *Sonoma Index Tribune*, centennial supplement, November 16, 1990, 21.
[28] "All the Feeble Minded Will Go To Glen Ellen," *Santa Rosa Press Democrat*, December 14, 1898, 1.
[29] "Statistical Monthly Record, Home for Feeble-Minded Children, Eldridge, California, July 1899-June 1904," Sonoma State Hospital Records, Mental Hygiene Department, California State Archives.
[30] *Fourth Biennial Report of the State Commission in Lunacy for the two years ending June 30, 1904* (Sacramento: California State Printing Office, 1904), 12.

garden.[31] By 1904, the institution's orchards and farm were able to produce a surplus that was sold on the open market, thereby bringing revenue to the hospital.[32] In 1905, the number of acres of orchard had increased, amounting to 120 acres in deciduous fruits and 24 acres in vines and small fruits, which produced an abundance of food that was consumed fresh, canned and dried.[33] It is likely that a portion of the orchard and vineyard acreages noted in 1904 were originally part of the William McPherson Hill homestead. Hill maintained five acres of apple trees and over 100 acres of vineyard in the 1880s, located mostly on the valley floor near the location of the hospital grounds. The Hill vineyards were maintained by the institution until at least 1915, when it was suggested by the Board of Managers that the "old vineyard be turned into a hog pasture."[34] However, vineyards were extant on hospital grounds as late as 1920.[35]

During this early period, the home also had a farm that consisted of 50 dairy cows producing milk for the institution and a poultry plant.[36] While the orchards, dairy and vegetable gardens continued to grow as the patient population increased, the necessity of a water supply became obvious to hospital administrators. As early as 1904, the superintendent stressed the need for the development of additional reservoirs.[37] In 1912, a reservoir named Fern Lake was established, but it could not supply enough water to support the hospital[38] (see Figure 7). Unfortunately, this water shortage would continue for several decades; although, it did not deter the development of additional orchards on the hills behind the institution.

By 1906, the dairy herd had grown to 73 cows and the new poultry plant was proving to be a profitable investment.[39] The primary agricultural products produced on the grounds included hay, fruit, milk and eggs.[40] Additionally, the hospital population continued to increase and by 1908, there were 729 inmates at the home.[41] At this time, ground was broken for the new administration building, reflecting the anticipated

[31] Ibid, 11.
[32] "Great State Institution of Which Sonoma County is Highly Proud," *Santa Rosa Press Democrat*, January 17, 1904, 17.
[33] *First Biennial Report of the State Board of Charities and Corrections of the State of California, from July 1, 1903, to June 30, 1904* (Sacramento: California State Printing Office, 1905), 60-61.
[34] "Minutes of the Board of Managers of Sonoma State Home, June 1, 1915 to December 1, 1917," Sonoma State Hospital Records, Mental Hygiene Department, California State Archives.
[35] "Minutes of the Board of Managers of Sonoma State Home, April 13, 1920," Sonoma State Hospital Records, Mental Hygiene Department, California State Archives.
[36] *Fourth Biennial Report of the State Commission in Lunacy for the two years ending June 30, 1904* (Sacramento: California State Printing Office, 1904), 101.
[37] Ibid, 11.
[38] *Eighth Biennial Report of the State Commission in Lunacy for the two years ending June 30, 1912* (Sacramento: California State Printing Office, 1912), 75.
[39] *Second Biennial Report of the State Board of Charities and Corrections of the State of California, from July 1, 1904, to June 30, 1906* (Sacramento: California State Printing Office, 1906), 67.
[40] *Third Biennial Report of the State Board of Charities and Corrections of the State of California, from July 1, 1906, to June 30, 1908* (Sacramento: California State Printing Office, 1908), 70.
[41] *Sixth Biennial Report of the State Commission in Lunacy for the two years ending June 30, 1908* (Sacramento: California State Printing Office, 1908), 96.

growth of the hospital in the future. The following year, in 1909, the institution's name was changed to the Sonoma State Home with its population having grown to 883 patients.[42] As the name change suggests, the facility was no longer intended to serve as a safe haven for children, rather, it was to become a melting pot of different people in need, with a wide array of ages and disabilities represented.

Regardless of the changes occurring on the main hospital grounds, the cultivation of fruit continued at an industrious rate. In 1908, the hospital superintendent reported that:

> *We have planted 30 orange and lemon trees, 155 cherry trees, 1,000 grapevines, all table varieties, and 1,600 blackberry, raspberry, and loganberry vines. Our large orchards of fruit trees are in splendid condition, and promise this season an abundant yield of fine fruit, including pears, peaches, apples, prunes, etc. . . . It has been considered by some that farming by the State did not pay, but our statistics prove to the contrary. . . The farm and orchards show a total profit for the biennial period of $6,509.77 over and above the cost of production.*[43]

Only two years later, there were approximately 41 acres of new orchard planted. This included: "…675 apple trees, 175 apricot, 115 cherry, 250 pear, 75 plum, 810 prune, and 575 peach, and of grapevines 1,147 vines."[44] The same report indicates that there was at least 50 acres of bearing orchard and 16 acres of vineyard already planted on hospital grounds by 1910.[45] In 1912, additional fruit trees were planted. This included approximately 100 pear trees and 450 peach trees that were placed in the Coon Trap Orchard[46] (see Figures 8 & 9). It should be noted that the precise location of the Coon Trap Orchard is unknown; however, it is most likely this description refers to the upper of the two extant orchards located behind the hospital grounds. Archaeologists have documented the approximate location of Coon Trap Road and have recorded the portions of the road still visible today. According to contemporary maps, the road was located southwest of the upper orchard.[47] It is possible that this road was constructed to provide access to the orchards during the historic period or it may have been a preexisting logging road.

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[42] Sonoma Developmental Center, "History of Sonoma Developmental Center," <http://www.dds.ca.gov/sonoma/sonoma_History.cfm> October 10, 2006. And the *Fourth Biennial Report of the State Board of Charities and Corrections of the State of California, from July 1, 1908, to June 30, 1910* (Sacramento: California State Printing Office, 1910).
[43] *Sixth Biennial Report of the State Commission in Lunacy for the two years ending June 30, 1908* (Sacramento: California State Printing Office, 1908), 95.
[44] *Seventh Biennial Report of the State Commission in Lunacy for the two years ending June 30, 1910* (Sacramento: California State Printing Office, 1910), 116.
[45] Ibid.
[46] *Eighth Biennial Report of the State Commission in Lunacy for the two years ending June 30, 1912* (Sacramento: California State Printing Office, 1912), 76.
[47] Contemporary project location map for the Jack London State Historic Park, produced by the Sonoma Ecology Center, September 2005.

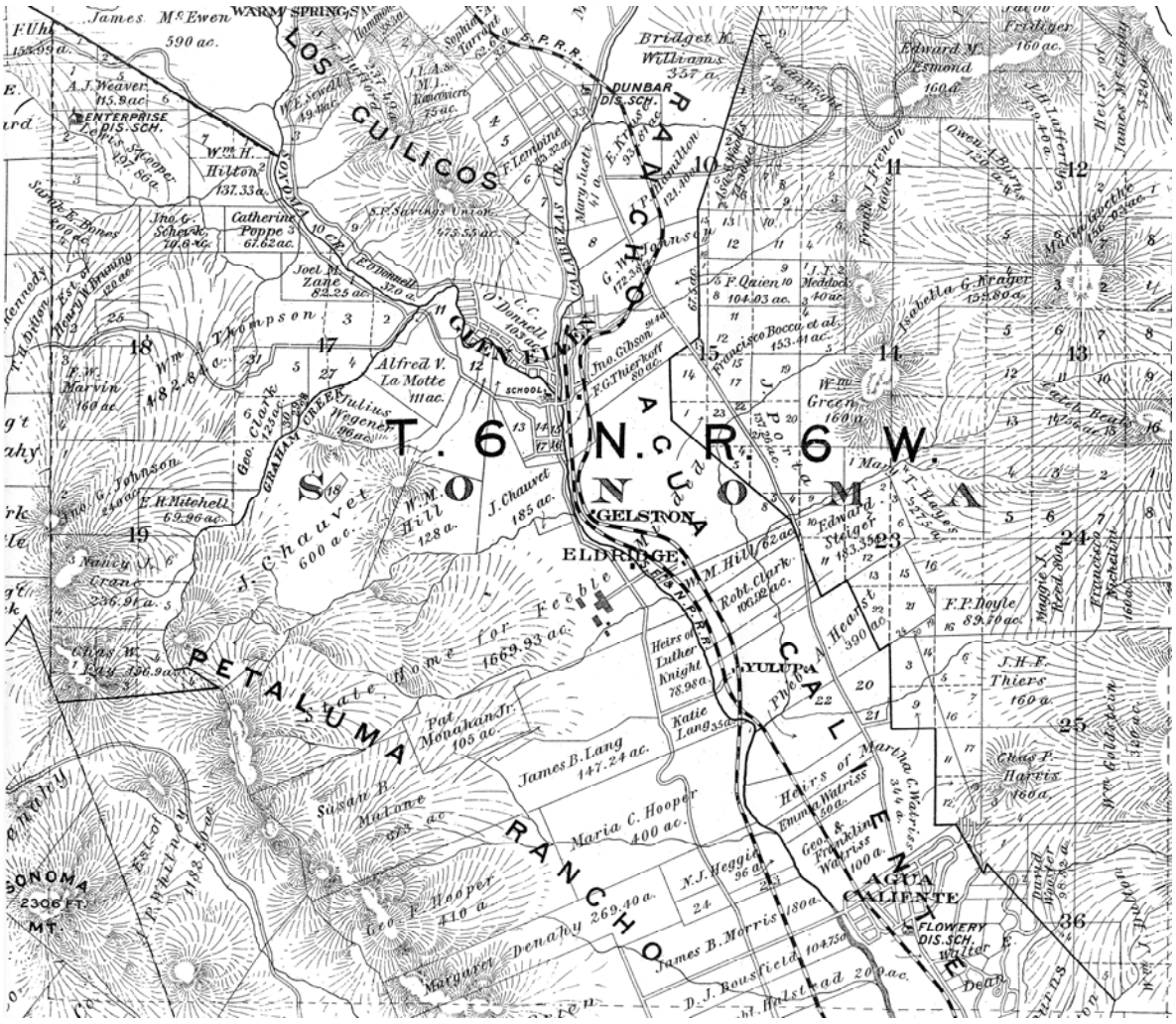

Figure 6: Historic map illustrating the property owned by the California State Home for the Care and Training of Feeble-Minded Children in 1897 (*Reynolds and Proctor*).

Figure 7: Historic photograph of horses near the Fern Lake Reservoir on the grounds of the Sonoma Developmental Center, n.d. Note the absence of vegetation near the shoreline (*Sonoma County Museum*).

Between 1908 and 1912, the orchards on the hills behind the home were planted with many species, including apple, apricot, cherry, peach, pear, plum, prune and quince. Approximately 100 acres of land was cleared for the planting of these orchards on the hill and vineyards (in addition to 40 acres of existing orchards near the hospital grounds). The trees were laid out by blocks of species, separated by a network of two-track roads and several larger truck roads. Apple and pear orchard areas were planted at 30 feet by 30-feet square spacing, which was typical for the largest orchard species on seedling rootstocks at the time. The other species were planted at 22 feet by 22-feet square spacing and generally laid out orthogonal to the bordering road to expedite vehicle access.

The form of the fruit trees was typical of their period in American horticultural history. Each fruit tree was grafted to a seedling rootstock (rather than a "clonal" rootstock, as found in contemporary horticulture), giving rise for a full-sized, or standard fruit tree. As such, each fruit tree in the orchard attained the characteristically large size for the period, requiring wide spacing and intensive pruning to control the vegetative vigor of the trees. Also typical of the early 20th-century, the fruit trees were formed into a 'low-

headed' shape, with a trunk shorter than the orchard trees of the 19th-century, at less than three feet tall. Low-heading of the trees was performed in the first three years after the planting of the trees to lower the height of the canopy for management. (In the 19th-century, no "heading" was performed, and fruit trees generally developed a natural tree trunk of five feet or more in height, with lower limbs often being browsed off by animals.)

Furthermore, the orchard floor was maintained as low ground cover by plowing or turning under the vegetation in the fall, and mowing throughout the growing season. This allowed for easy access to the trees for the routine tasks of pruning, spraying, thinning and harvesting. Orchard equipment such as sprayers, plows and mowers were originally pulled by horses, but were later operated using the aid of tractors in the 1920s and 1930s. It is probable that Orchard Road was constructed during the mid 1910s to allow employees, patients, horses and machinery access to the bearing orchards (see Figure 10). Both historically and at the present, Orchard Road served/s as a primary circulation route between the main hospital grounds and the orchards. Significant due to its association with the working infrastructure of the orchard, the road is defined by its cut and fill profile, which suggests a moderate level of engineering when the road was constructed. In contrast, many of the secondary two-track roads, which run through the orchards, show little engineering sophistication.

Figure 8: Historic photograph looking east from the Sonoma State Home, circa 1910s. Note the extensive acreage of fruit crops visible (*Sonoma Valley Historical Society, Lindberg Collection*).

Figure 9: Historic bird's eye view of the Sonoma State Home showing horticultural crops and railroad tracks in the foreground and the hospital grounds in the background, n.d. *(Sonoma Valley Historical Society, Lindberg Collection*).

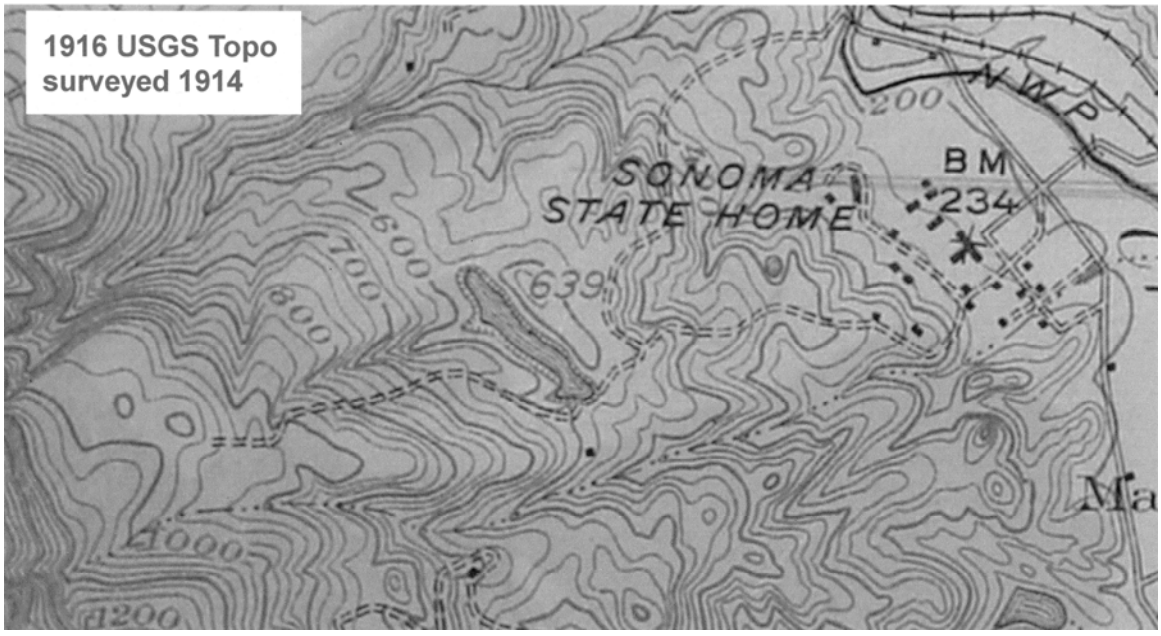

Figure 10. Historic 1916 USGS topographic map showing the location of Orchard Road and the associated Sonoma State Home (*Sonoma Ecology Center*).

Between 1910 and 1920, the patient population at the Sonoma State Home increased by nearly 50%.[48] In 1914, there were a total of 1,059 patients receiving care at the facility. Less than ten years later, by 1922, there were 1,843 patients at the home. Interestingly, during this period of time, the patient population who "worked" grew from 296 in 1914 to 780 in 1922.[49] It is likely that many of those patients who were working may have labored without pay in the orchards and on the dairy farm. As the number of working patients increased, the newly planted orchards began to bear fruit. In 1916, the hospital superintendent reported that: "Our farm work has been going along nicely. Our young orchard in the hills back of the home is beginning to bear and the yield of fruit is satisfactory." [50] During this time, it was noted in the minutes of the Board of Managers for the Sonoma State Home, that the orchards were maintained and cultivated annually. Furthermore, the fruit was harvested and the trees were pruned as well as sprayed. At the same time, the quince orchard and vegetable gardens were also producing a plethora of quince and vegetables such as carrots, lettuce, green onions, parsley, peas, rhubarb, artichokes, radishes and sage. [51]

The Board of Managers notes reveal that the orchards were maintained and cultivated using the best techniques available at the time. According to the Board's notes from 1915-1917, numerous orchard activities were carried out by hospital employees and patients. The following synopsis serves as an example of the maintenance and harvest schedule for the hospital orchards.

In August, the orchards were cultivated and sprayed with lime. During this period, the early fruit was harvested and canned. Spraying and harvesting activities continued into September, with the canning and drying process occurring simultaneously. By October, the fruit harvest, as well as canning and drying, marked the primary activities for the month with the harvest season ending in November. From November through March, pruning was completed and the orchards were plowed. During this time, orchard managers also began spraying the fruit trees. Spraying continued into the months of April, May and June. Thinning also occurred in the month of June. By July, the cherry and blackberry harvest began, with early apples not far behind. It is likely that the orchard managers followed a similar harvest and maintenance schedule annually throughout the period in which the orchards were utilized.

By 1918 significant quantities of fruit and vegetables were grown in the hospital gardens and orchards. The most common method of preserving the produce was by canning. Due to the large volume of fruit and

[48] Kline, 33.
[49] "Statistical Monthly Record, Sonoma State Home, May 1914-June 1922," Sonoma State Hospital Records, Mental Hygiene Department, California State Archives.
[50] *Tenth Biennial Report of the State Commission in Lunacy for the two years ending June 30, 1916* (Sacramento: California State Printing Office, 1916), 109.
[51] "Minutes of the Board of Managers, Sonoma State Home, June 1, 1915 to December 1, 1917," Sonoma State Hospital Records, Mental Hygiene Department, California State Archives.

vegetables produced, a cannery building was erected in 1918 to process the food. [52] Later, hospital officials would construct other buildings related to orchard fruit production and food preservation. These buildings included a fruit drying shed, constructed in 1935; a dried fruit storage shed, constructed in 1937; a larger cannery building, constructed in 1941 and a dehydrator building constructed in 1947.[53] It is likely that several of these buildings were constructed on a clearing of land, located between the upper and lower orchards near the contemporary location of Camp Via. Several of the other buildings may have been located closer to the main hospital campus on the terraces below the orchards.

Not surprisingly, Sonoma State Home's population continued to increase significantly as the years passed. In July 1922, there were 1,846 patients in the home. By October 31, 1930, the patient population had risen to 3,667 people. Of the total population, those "at work" numbered 773 in July 1922. The number of those "at work" increased to 1,147 in October 1930.[54] Due to the growing number of patients admitted into the hospital, it became increasingly important that the orchards continue to bear large amounts of high quality fruit. As a result, the orchards were meticulously cared for by managers to ensure maximum production. This was reflected in a statement made by a supervisor who reported that: "The young orchard is in fair shape; will have it in first class condition very soon." [55] It is possible that the high level of maintenance and care executed by orchard managers, employees and patients may have attributed to the continued livelihood of the fruit trees extant in the orchards today.

Throughout the 1930s, the hospital's orchards, farming and dairy operations continued to produce a large amount of food for the growing patient population. The following table illustrates the fluctuation in food production, number of dairy cows, poultry and hogs on the farm as well as the acreage of orchards, gardens and hay from 1935-1940.

[52] *Eleventh Biennial Report of the State Commission in Lunacy for the two years ending June 30, 1918* (Sacramento: California State Printing Office, 1918), 76.
[53] "Sonoma State Home: Names and Ages of Buildings," Sonoma Developmental Center Staff Library records.
[54] Sonoma State Hospital Records, Mental Hygiene Department, California State Archives.
[55] "Minutes of the Board of Managers, Sonoma State Home, March 9, 1920 - May 31, 1921," Sonoma State Hospital Records, Mental Hygiene Department, California State Archives.

Year	No. of Cows	No. of Hogs	No. of Poultry	Acres of Hay	Acres of Orchards	Acres of Gardens	Gal. from Cannery
1935	288	366	6622	125	140	62	39,090
1936	127	398	2445	125	140	62	38,382
1937	366	280	9162	125	140	62	49,210
1938	334	319	10,781	125	140	62	42,875
1939	352	344	11,157	--	--	--	32,000
1940	399	426	7,897	--	--	--	44,800

Table 2: Table illustrating food production at the Sonoma State Home, 1935-1940.

By the early 1940s, patient enrollment had reached an all time high, breaching the 4,000 mark.[56] During this time, the hospital was faced with many hardships. Due to U.S. involvement in World War II, there was a severe labor shortage at the hospital.[57] It is likely that the role of patients as laborers became even more important to the daily upkeep of the institution. By the end of the war, hospital patients were still tending the farms and orchards; however, their labor was now described as a means of promoting occupational or industrial therapy. It was believed that this form of rehabilitation would keep the minds and bodies of the patients occupied, which would speed up their recovery. Interestingly, during this era, the male patients received training in the care of livestock and in farming operations, while female patients were occupied by performing household tasks.[58]

It is clear that both the upper (presumably, the Coon Trap Orchard) and the lower orchards, located behind the institution were at their height in the late 1930s and early 1940s, especially when considering the large volume of fruit canned in 1940. According to an aerial photograph taken in 1942, the orchards on the hill were filled to capacity with fruit trees, showing no indications of irregular spacing or standing dead trees. Furthermore, the trees appeared to be in good condition with live canopies exceeding 80% cover. It is most likely that these trees were planted in 1910 (see Figure 11).

[56] "Statistical Monthly Record, Sonoma State Home, July 1939 to October 1947," Sonoma State Hospital Records, Mental Hygiene Department, California State Archives.
[57] *Statistical Report of the Department of Institutions of the State of California, for the year ending June 30, 1945* (Sacramento: California State Printing Office, 1945), 99.
[58] *Statistical Report of the Department of Mental Hygiene of the State of California, for the year ending June 30, 1947* (Sacramento: California State Printing Office, 1947), 164.

After World War II, administrators at the Sonoma State Home instituted a 13 million dollar building construction program to supplement the needs of the growing institution.[59] By the end of 1951, the building program had been completed. A large proportion of the new development occurred on the east side of Arnold Drive, near Sonoma Creek and included the addition of five ward buildings, a therapeutic nursery, a central kitchen, bakery, meat shop and dining rooms.[60] At the same time, the orchards behind the hospital continued to produce a large volume of fruit. Not surprisingly, a significant proportion of the fruit was still harvested by hospital patients. In 1953, it was reported that 15,000 pounds of apples were sold to Mendocino State Hospital as a surplus.[61] In the same season, a large portion of the plum crop was also taken to Napa State Hospital for canning.[62] While the transfer of canning responsibilities may have represented a shifting emphasis away from fruit preservation at the Sonoma State Home, fruit growing remained a viable asset at the institution for nearly another decade.

An Era of Change

By the mid 1950s, mental healthcare in the United States began undergoing significant changes. In 1953, the Sonoma State Home changed its name to the Sonoma State Hospital. During this period, there was an increased concern regarding the ethical treatment of patients. Additionally, at this time there was a greater acknowledgement of patient rights. As a result of the changing healthcare system, a five million dollar building program was initiated in 1956 to better serve Sonoma State Hospital's patients.[63] Ultimately, the building program provided larger living quarters with more privacy for patients. Accordingly, the hospital was forced to decrease the number of patients admitted into the institution. This action resulted in the admittance of only those patients with severe disabilities.[64]

As new construction was undertaken, the orchards continued to provide the hospital with fruit; however, it is clear that the orchards heyday had come to an end by 1957. In 1959, the orchards were still maintained by a few hospital patients and employees and it was even suggested that Agricultural Extension agents from Davis or Sacramento travel to the hospital to demonstrate new spraying and orchard techniques.[65] As a 1961 aerial photograph suggests though, the orchards were already declining at this time. Irregular

[59] "Eldridge Project: State Home Program is Underway," *Sonoma Index-Tribune*, November 12, 1948, 1.
[60] *Biennial Report for 1950-1952 for the State of California Department of Mental Hygiene* (Sacramento: California State Printing Office, 1952).
[61] "Monthly Director's Report, September 1953," Sonoma State Home, Inter-Departmental Communication, October 2, 1953.
[62] "Monthly Director's Report, August 1953," Sonoma State Home, Inter-Departmental Communication, September 2, 1953.
[63] "Sonoma State Hospital first opened in 1891," *Sonoma Index-Tribune*, June 21, 1973.
[64] "Food Service Prepares Over 10,000 Meals a Day," *Sonoma Index-Tribune*, special supplement, November 22, 1966, 18.
[65] "Training Needs Survey," Sonoma State Hospital, 1959, 32.

spacing associated with die out and tree canopies with less than 80% cover were characteristic of the orchard condition in the early 1960s. Significantly, another feature expressed in the aerial photograph includes large areas of both the upper and lower orchards that were cleared of fruit trees. This is most clearly exhibited by a large rectangular clearing in the lower orchard. It is likely that these areas were originally planted with peaches, which are a short-lived tree. As a result of the short life span of the peach, it is to be expected that these trees would have been removed under productive orchard management (see Figure 12).

During this time the dairy farm was also beginning to decline. In 1959, employees from the farm indicated that they believed that there was a "non-acceptance of the farm by the administration."[66] Furthermore, it was suggested that the only way that the dairy farm would be able to continue to function, would be if it could serve as a training orientation for patients.[67] As hospital demographics and perceptions regarding patient rights continued to change, it soon became clear that it was no longer acceptable for patients to work in the orchards and on the dairy without receiving monetary compensation.

As patient's rights and privileges were acknowledged, hospital residents were encouraged to participate in outdoor activities that were not associated with physical labor. Occurring almost simultaneously, the hospital orchards continued to dwindle during this period. Buildings once associated with the harvest and processing of fruit were no longer utilized as heavily as they were during previous years. At this time, a shack, spray shed and barn/tractor shed, all of which were historically associated with the cultivation of fruit, were extant, but probably no longer necessary. As a result, the land and buildings once associated with the cultivation of fruit was developed into Camp Via, an outdoor retreat for hospital patients.

In 1961, development plans were created for the camp, which included the installation of a picnic area, barbeque grills, a playground and campsites. Having been completed in 1962, Camp Via served as an outdoor recreational retreat for children and adults with developmental disabilities. While the orchards continued to bear fruit and were not formally closed until several years later, the development of this camp may have been the impetus for their eventual closure. Today, Camp Via continues to function as a retreat from the hospital, however; patients no longer camp in the area.

[66] Ibid.
[67] Ibid.

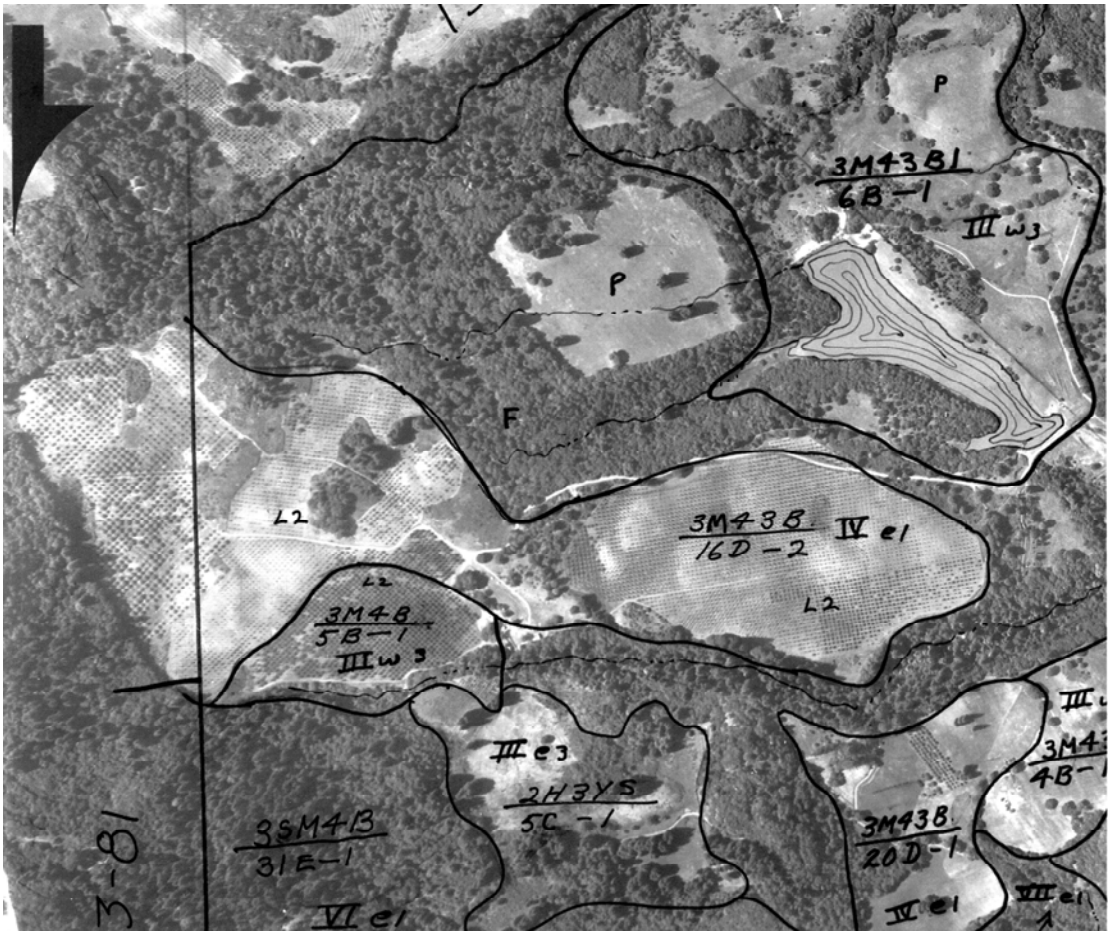

Figure 11: Historic aerial photograph showing the upper and lower orchards of the Sonoma Developmental Center Orchard, then part of the Sonoma State Home (to become Sonoma Developmental Center) 1942 (*Sonoma Ecology Center*).

Figure 12: Historic aerial photograph from 1961 illustrating the location of the upper and lower orchards of the Sonoma Developmental Center Orchard, then part of the Sonoma State Hospital (to become the Sonoma Developmental Center). The photo shows some fruit tree loss by this time, however, at least 90% of the original orchard remained intact (*County of Sonoma-Assessor Division, Santa Rosa, CA*).

By the mid 1960s, the Sonoma State Hospital had adapted to better serve the changing needs of their patients. Following a decentralized system of providing health care to those with disabilities, the hospital population dramatically declined as community-based treatment options became available. At the same time, consumer trends were shifting as canned fruits and vegetable as well as frozen meats became increasingly popular and economical. As a result, the hospital no longer needed the ample supply of fresh fruit and dairy, originally produced by the farms and orchards, to feed patients. Regardless, the dairy farm and piggery were maintained and even managed to flourish during this period. In 1966, the Holstein dairy herd at the Sonoma State Hospital was reported to be one of the best in the state; however the number maintained in the herd had declined in recent years.[68] At this time, the farm included a 100-acre dairy area, 150 acres of grazing land, and nine acres of hog ranch.[69]

In 1968, the California State Department of Mental Hygiene notified hospital administrators that the Sonoma State Hospital dairy farm and piggery would need to close. According to a local newspaper, these

[68] "Dairy Herd Earned $53,000 Last Year," *Sonoma Index-Tribune*, special supplement, November 22, 1966, 21.
[69] Untitled article, *Santa Rosa Press Democrat*, April 19, 1968.

were the only two remaining farming activities at the hospital as the poultry, vegetable garden and orchards were discontinued several years prior.[70] It is uncertain when the orchards were officially closed, however, it is likely that they were closed in 1966. A map, created in 1966, documented the orchard fruit species extant at the time. Presumably, this map was drawn as documentation of the orchard prior to its abandonment (see Figure 13). It should be noted that at the same time, the farms at Camarillo and Patton State Hospitals were also being terminated, while the piggery at Mendocino State Hospital was expected to stay open only through the summer months. As hospital farms closed in the State of California in the late 1960s, an era of self-sufficiency and isolation came to an end. The Sonoma State Hospital had transformed itself into a new institution that would serve the needs of patients with severe disabilities in a more open environment with greater connection to outside community services.

After peaking at approximately 4,000 patients in the 1940s, Sonoma State Hospital population trends began to shift. By the early 1970s there were 2,700 patients and 1,700 employees, reflecting a decline in patient populations and an increase in the number of employees hired to care for patients.[71] Accompanied by population declines, numerous other changes were occurring within California's system of mental health facilities. In 1972, the Lanterman Act was passed, which "entitled persons with developmental disabilities to rights and privileges."[72] Furthermore, during this period, California Governor, Ronald Reagan, initiated a plan to close the remaining 11 state institutions serving the mentally disabled in California, including the Sonoma State Hospital, by 1983.[73] The 1970s and 1980s were a period of political uncertainty for the future of Sonoma State Hospital, which led to external scrutiny and internal reviews of hospital procedures and operations. Ultimately, the hospital was spared closure, though many other State Hospitals were shut down at this time.

While Sonoma State Hospital and many other similar hospitals fought to stay open in the early 1970s, the orchards behind the institution were maintained by private parties who leased the land from the hospital.[74] The parties maintained specific orchard areas that were the most productive by the time, which included the apples, plums and prunes. Furthermore, these orchard areas were mown and the trees were pruned and braced to prevent splitting. Traces of these efforts are visible in the orchard today and make evident the last period of intensive cultivation of the orchards. It should be noted, however, that regardless of the maintenance undertaken, the orchards continued to decline. When comparing aerial photographs from 1961 to 1971, considerable landscape change occurred. In the upper orchard, approximately one-half of the existing apple and pear trees were gone by 1971. Additionally, nearly all of the peach trees were gone by

[70] Ibid.
[71] "Sonoma State Hospital first opened in 1891," *Sonoma Index-Tribune*, June 21, 1973.
[72] "1891-1991 A Century of Building Lives," supplement to the *Sonoma Index-Tribune*, November 16, 1990, 20.
[73] Untitled article, *Santa Rosa Press Democrat*, March 18, 1973.
[74] Phone interview, Susan Dolan to Johnny Fry, November 2006.

this time and approximately 50% of the cherry trees had died out in the upper orchard. Similar patterns also existed for the lower orchard when considering the peach trees, which have a shorter lifespan than other fruit trees (see Figure 14).

As the years progressed, the patient population at the Sonoma State Hospital continued to decline exponentially. By 1978, there were 1,880 patients living at Sonoma as the hospital underwent a remodeling plan, which called for the modification of numerous buildings associated with the facility.[75] Scheduled for completion in July 1982, this new development was designed to give patients more privacy as well more efficient, personalized care. Coinciding with these changes, in 1986, the name of the facility changed from the Sonoma State Hospital to the Sonoma Developmental Center (SDC), representing yet another new era in the hospital's history.

Following suit, the orchards remained dynamic, changing as the years progressed. Aerial photographs from the 1980s and 1990s reflect these changes. Significantly, the upper and lower orchards began to become reforested by native woody vegetation and tall grasses during this period. Furthermore, in the upper orchard, the rear portion of the pear orchard, near the tree line, was in decline. This was also the case for the peach and apricot orchards, which had few fruit trees ranging from fair to poor condition. Meanwhile, the apples, prunes and southern plums in the upper orchard remained in good condition; however, irregular spacing due to die out was visible. On the other hand, the lower orchard had two discreet plantings of fruit trees left. The first, located near Camp Via and the second, near the southern tip of the tract were in fair to poor condition with less than an 80% live canopy cover (see Figures 15, 16 & 17).

Throughout the 1990s, the SDC patient population continued to slowly decline. By the end of the decade, the building and grounds associated with the SDC began to draw the attention of the local community. In 2000, the main building on the SDC grounds was nominated to the National Register of Historic Places. Less than two years later, the hospital sold 600 acres of surplus land to the adjacent Jack London State Historic Park.[76] Today, hospital patient population trends continue to decline. In November 2006, the SDC reported that the hospital had 722 patients.[77] Meanwhile, the Sonoma Developmental Center Orchard, now within Jack London State Historic Park, is nearly 100 years old. The orchard is in poor condition, but serves as a destination for park visitors and fruit enthusiasts. Despite its condition, the trees stand as a

[75]"Construction to Begin at Sonoma," *Eldridge Gazette*, December 1978.
[76] Pamela J. Podger, "Jack London Park Adds 600 Acres," *San Francisco Chronicle*, September 5, 2002, A-19.
[77] Sonoma Developmental Center, "Sonoma Developmental Center's Population and Historic Trends," <http://www.dds.ca.gov/Sonoma/SonomaPop.cfm> December 4, 2006.

testament to the historical development of an institutional fruit orchard and as an outstanding example of orchard horticulture prior to World War II (see Figure 18).

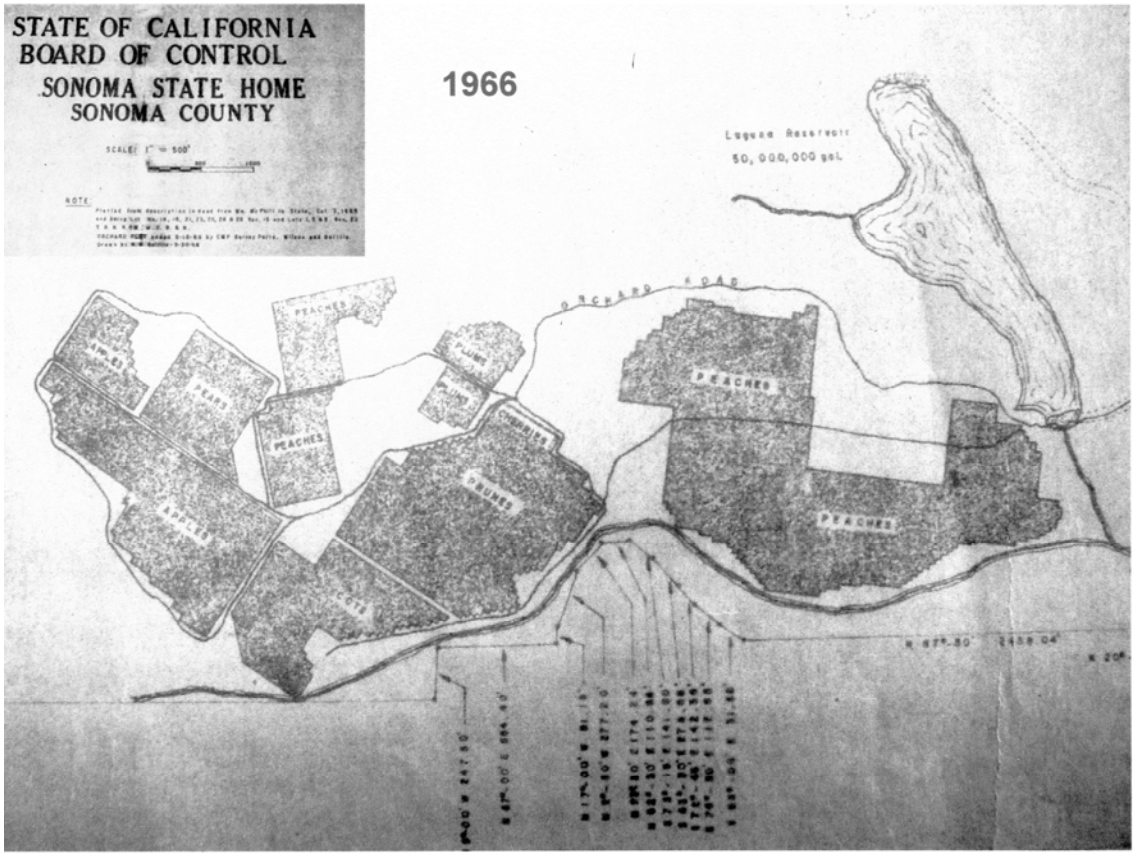

Figure 13: Historic 1966 map illustrating the location of orchard species areas in the Sonoma Developmental Center Orchard, then part of the Sonoma State Hospital (to become the Sonoma Developmental Center). The same distribution of species is still evident today (*Sonoma Ecology Center*).

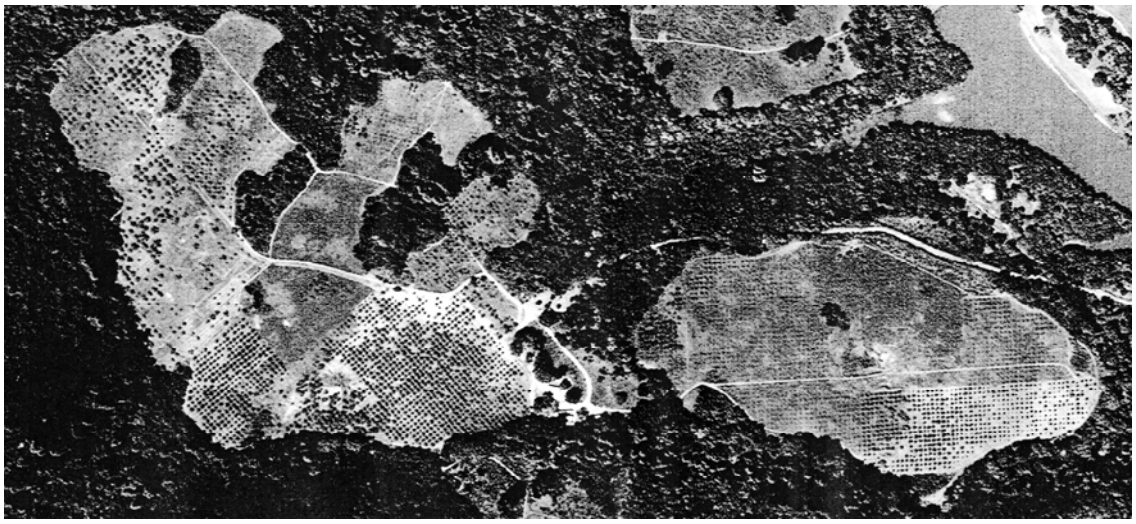

Figure 14: Aerial photograph from 1971 illustrating the location of the upper and lower orchards of the Sonoma Developmental Center Orchard, then part of the Sonoma State Hospital (to become the Sonoma Developmental Center). The photo shows loss of some apple trees and many peach trees in the upper (left) orchard and reforestation beginning in the upper and lower orchards (*County of Sonoma-Assessor Division, Santa Rosa, CA*).

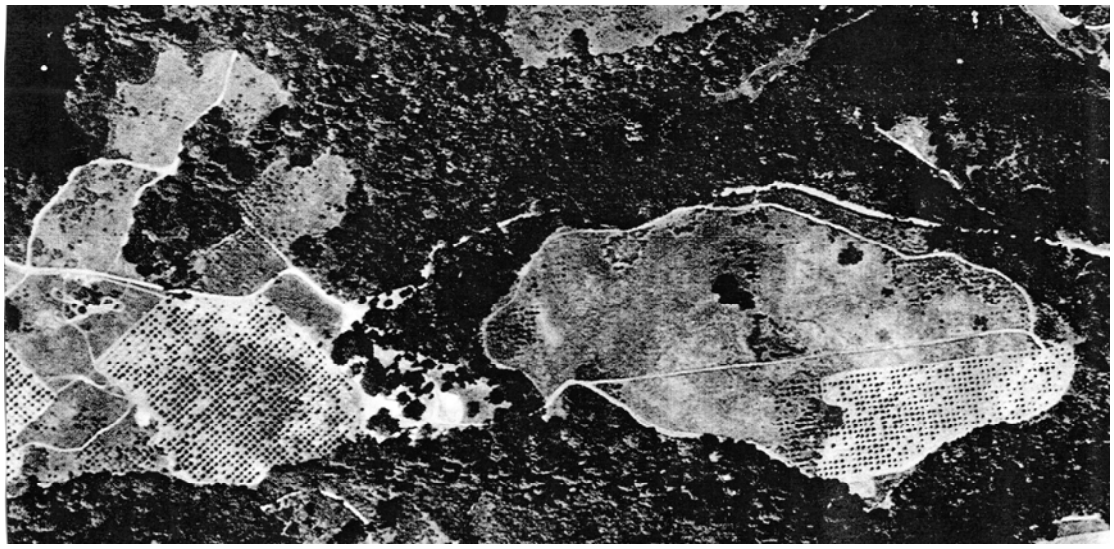

Figure 15: Aerial photograph showing the location of a portion of the upper orchard, and the entirety of the lower orchard of the Sonoma Developmental Center Orchard, then part of the Sonoma Developmental Center, May 3, 1980. The photo illustrates a loss of many of the peach trees in the lower orchard (the trees that remain are mostly plums) and the loss of the majority of the peach trees from the upper orchard (*County of Sonoma-Assessor Division, Santa Rosa, CA*).

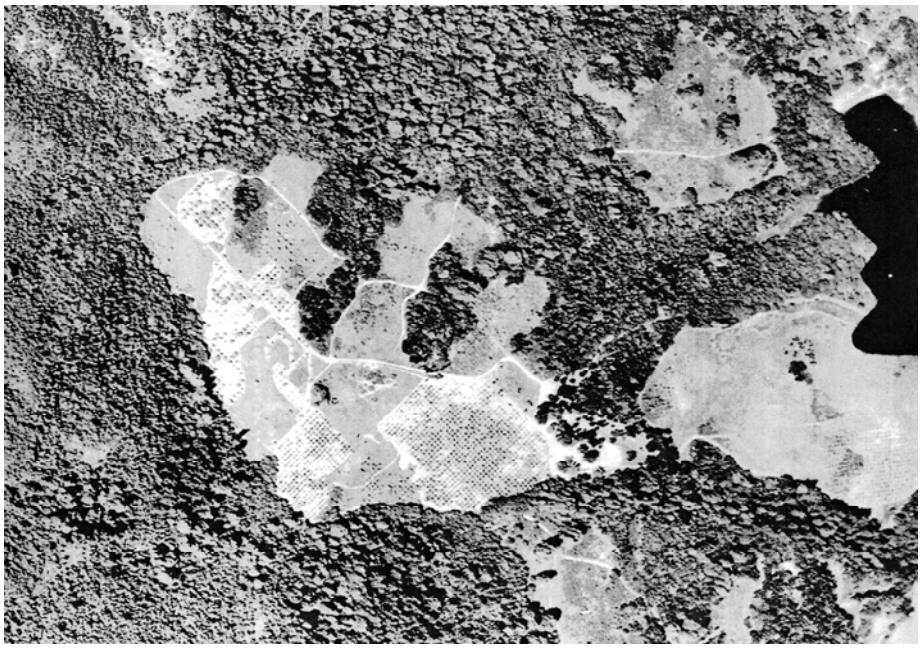

Figure 16: Aerial photograph showing the location of the upper orchard of the Sonoma Developmental Center Orchard, then part of the Sonoma Developmental Center, May 7, 1980. The photo illustrates a loss of apple, pear, cherry and apricot trees. Furthermore, the photo shows mowing patterns, which indicate a continued cultivation of the prune, plum, apple and pear orchard areas by this time under a lease agreement (*County of Sonoma-Assessor Division, Santa Rosa, CA*).

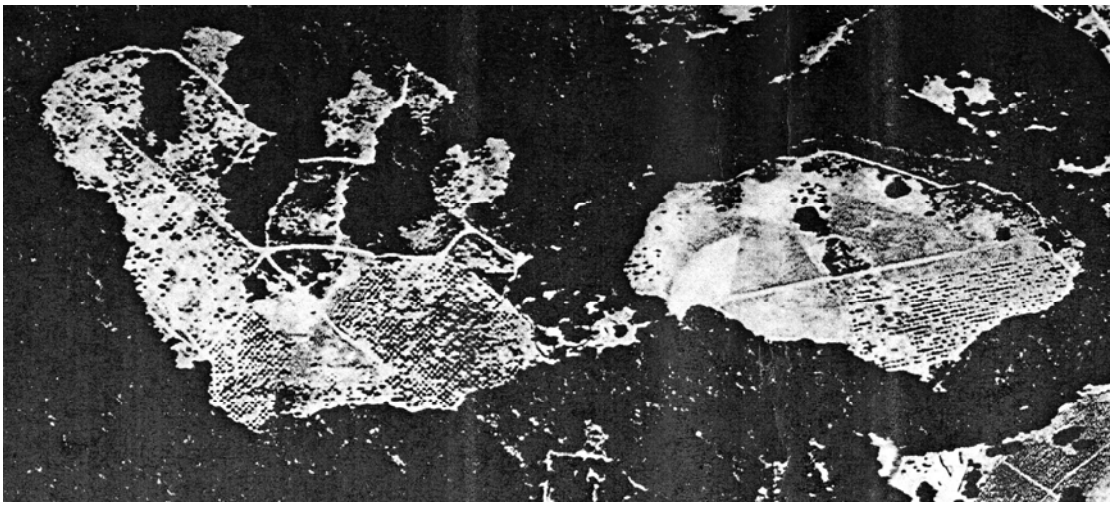

Figure 17: Aerial photograph from 1990 showing the location of the upper and lower orchards of the Sonoma Developmental Center Orchard, then part of the Sonoma Developmental Center. The photo illustrates a loss of 50% of the original orchard trees and cleared orchard areas undergoing reforestation (*County of Sonoma-Assessor Division, Santa Rosa, CA*).

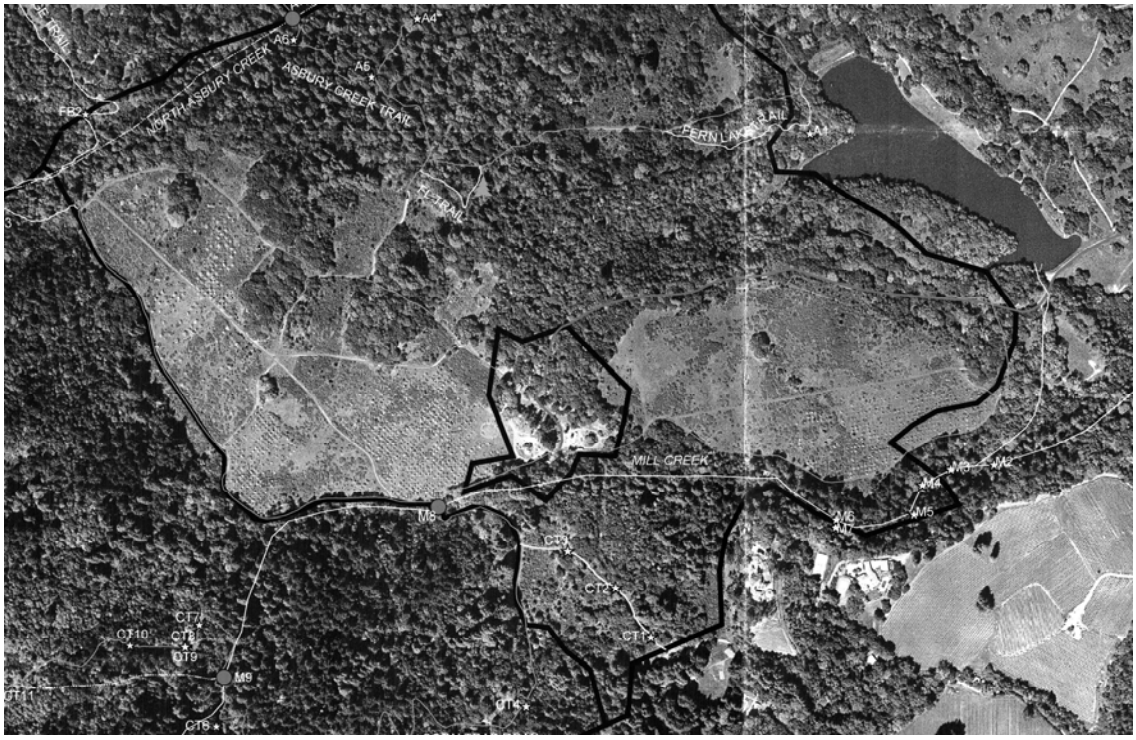

Figure 18: Contemporary aerial photograph showing the location of the upper and lower orchards of the Sonoma Developmental Center Orchard, adjacent to the Sonoma Developmental Center. The photo illustrates hundreds of fruit trees still extant, though with many losses and native reforestation of former orchard areas (*Sonoma Ecology Center*).

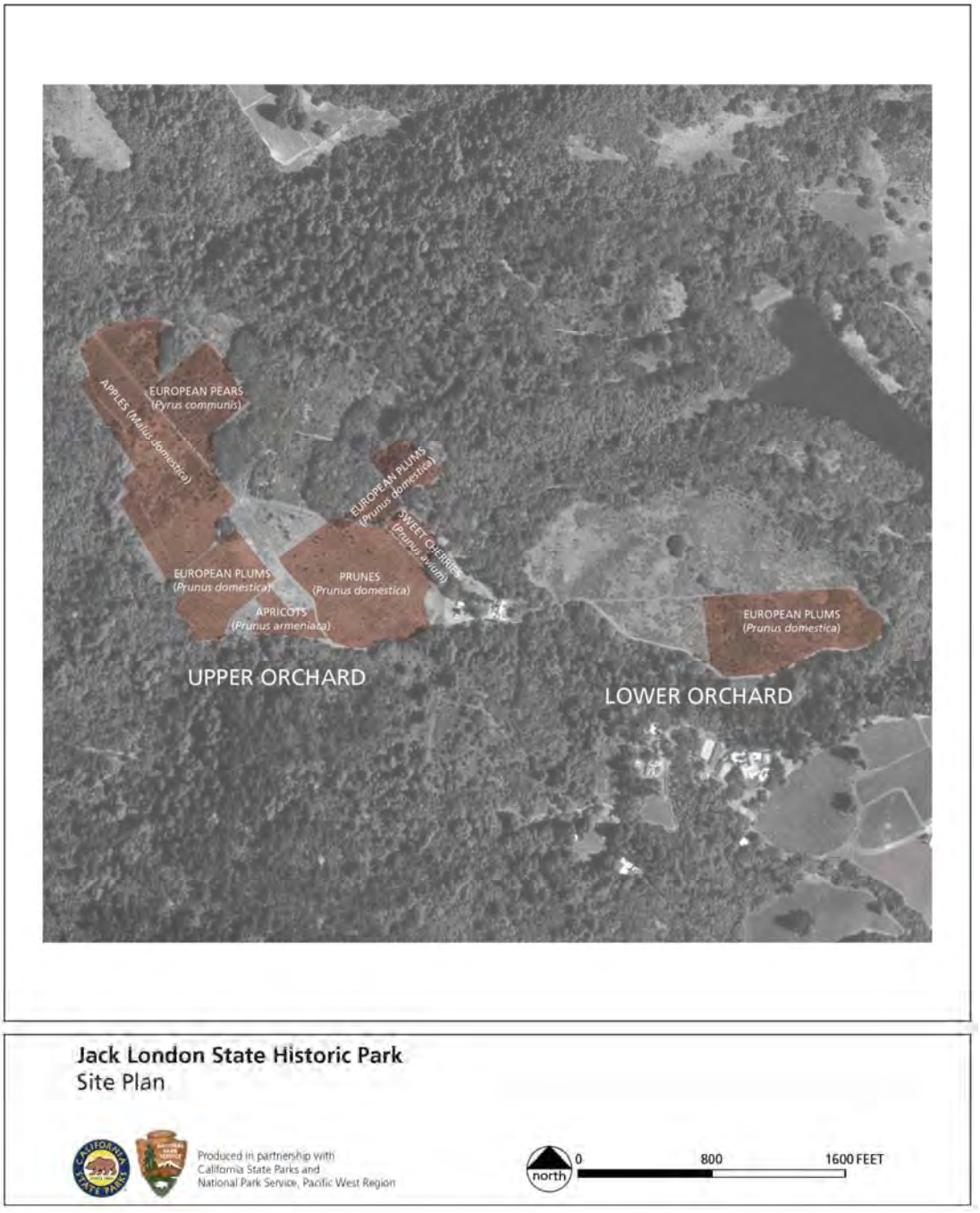

Figure 19: Site plan showing the upper and lower orchards of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS,PWR,2006)*.

Figure 20: Site plan showing the layout of fruit species within the upper orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS,PWR,2006)*.

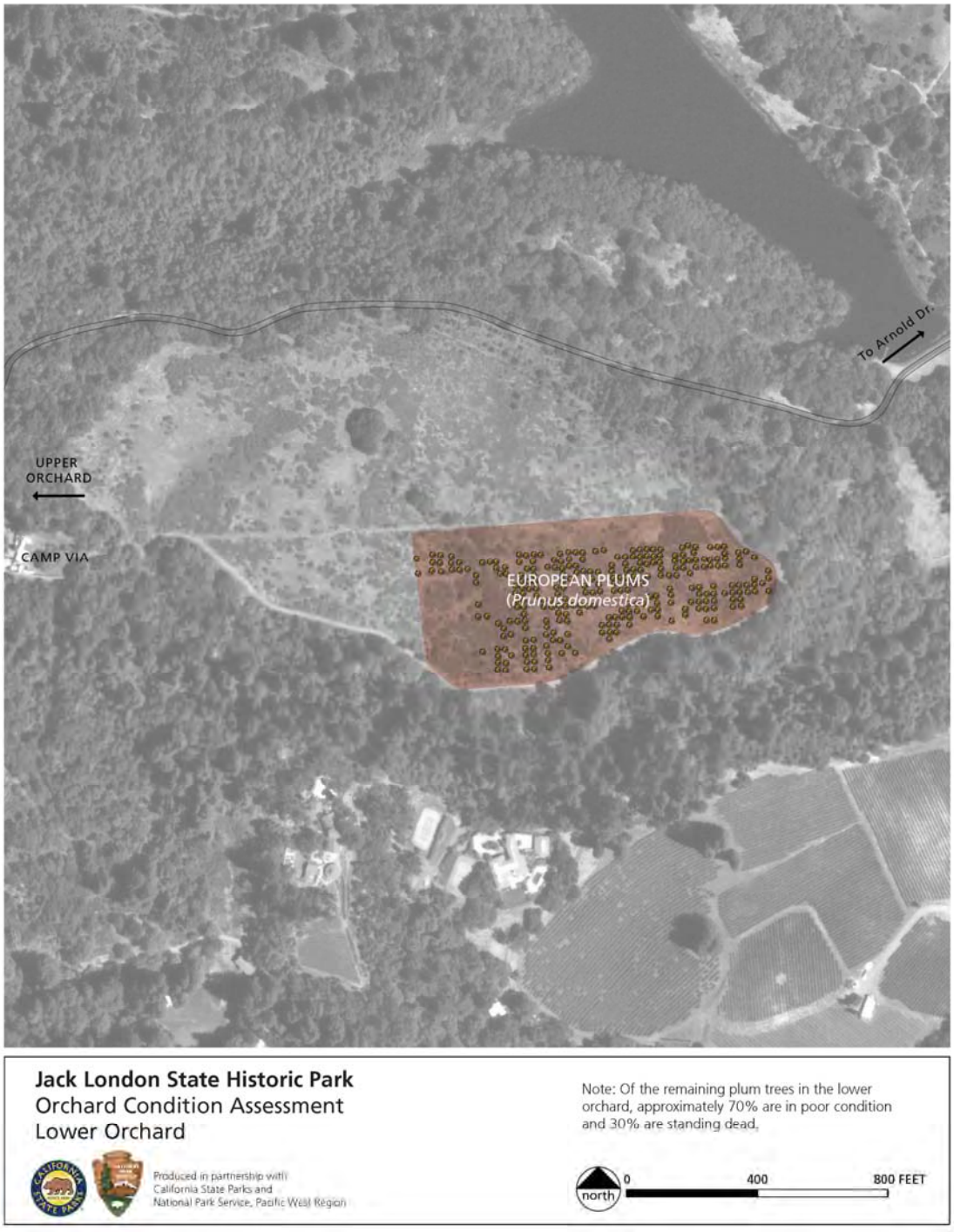

Figure 21: Site plan showing the fruit species within the lower orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS,PWR 2006)*.

ANALYSIS AND EVALUATION OF LANDSCAPE CHARACTERISTICS

Introduction

Based on evidence provided by historical research and field documentation, the analysis and evaluation process determines the significance and integrity of extant landscape characteristics that are associated with a particular landscape or historic site. [78] The integrity of a landscape is determined by a number of factors. Historical integrity is confirmed by the "survival of physical characteristics that existed during its historic or prehistoric period."[79] It is illustrated by the extent to which the landscape or site retains its historic appearance. In contrast, historic significance refers to the "meaning or value ascribed to a structure, landscape, object or site based on National Register criteria for evaluation."[80]

The term landscape characteristic can be applied to "either culturally derived or naturally occurring processes or to cultural and natural forms that have influenced the historical developments of the landscape or are the products of its development."[81] Significantly, landscape characteristics can help us define the landscape to achieve a greater understanding of its cultural value. Examples of individual landscape characteristics include the following: natural systems and features, spatial organization, land use, cultural traditions, cluster arrangement, circulation, topography, vegetation, buildings and structures, views and vistas, constructed water features, small-scale features and archaeological sites. In essence, these are patterns or processes that historically influenced the development of the cultural landscape, or were created as a result of its development.

When applying the criteria listed above, the Sonoma Developmental Center Orchard at Jack London State Historic Park possesses five landscape characteristics that retain significance and integrity. These include: land use, spatial organization, circulation, vegetation and natural systems and features. Land use as an individual landscape characteristic refers to the "organization, form, and shape of the landscape in response to land use."[82] Agricultural fields, pastures and quarries serve as examples. The next landscape characteristic, spatial organization, refers to the "arrangement of elements creating the ground, vertical, and overhead planes that define and create spaces."[83] Examples of features associated with spatial organization include views and vistas, divisions of property and topography. Circulation, another type of landscape

[78] Robert R. Page, Cathy A. Gilbert and Susan A. Dolan, *A Guide to Cultural Landscape Reports: Contents, Process and Techniques* (Washington D.C.: USDI, NPS, Cultural Resource Stewardship and Partnerships, Park Historic Structures and Cultural Landscapes Program, 1998), 125.
[79] Ibid, 137.
[80] Ibid, 137.
[81] Ibid, 139.
[82] Ibid, 53.
[83] Ibid, 53.

characteristic, is defined by spaces and features that "constitute the systems of movement in a landscape."[84] Examples include paths, sidewalks and roads. The fourth type of landscape characteristic associated with the site includes vegetation. Vegetation refers to "individual and aggregate plant features of deciduous and evergreen trees, shrubs, vines, ground covers and herbaceous plants, and plant communities, whether indigenous or introduced."[85] Perennial gardens, orchards and specimen trees are just a few examples of vegetation. Natural systems and features is another landscape characteristic that retains integrity in the Sonoma Developmental Center Orchard. Defined as the "natural aspects that have influenced the development and physical form of the landscape," it can include geomorphology, geology, hydrology, ecology, climate and native vegetation.[86] Ravines, valleys and watersheds are examples of this type of landscape characteristic.

Land Use

The land use of the Sonoma Developmental Center Orchard retains integrity, which contributes to the site's historic significance. Historically, approximately 100-acres of land were planted in fruit trees between the upper and lower orchards. The upper orchard was approximately 60 acres and the lower orchard was approximately 40 acres. Today, 52-acres remain as cleared orchard land in the upper orchard and of these 21 acres have extant fruit trees. Currently, 32-acres remain as cleared orchard land in the lower orchard (though these are gradually reforesting), of these 5.5 acres have extant fruit trees.

Historically, the land associated with the Sonoma Developmental Center Orchard was part of the Petaluma, Agua Caliente Grant that was given to General M.G. Vallejo by the Mexican Government in 1834.[87] Vallejo owned the property for only a short period of time before losing it as a result of shifting political ideologies. Several years later, circa 1848, records indicate that the Asbury family settled on a piece of land that was originally part of the land grant mentioned-above. For unknown reasons, the Asbury family left the area after only a few years. By 1867, William McPherson Hill had purchased a large acreage of property in Sonoma Township and planted orchards and vineyards. It is likely that Hill's purchase included lands originally associated with the Petaluma, Agua Caliente Grant as well as the Asbury property. Hill owned the property that is now associated with the orchards until 1889 when he sold it to the state of California for the development of a home for children with developmental disabilities.

[84] Ibid, 128.
[85] Ibid, 149.
[86] Ibid, 142.
[87] Gail Sifford, "Requiem for Angelestha Griggsby: Parent Hospital Association Historian," *Eldridge Gazette*, February 1980, 6.

The California Home for the Care and Training of Feeble Minded Children was established in 1891. From an early date, the hospital maintained the existing Hill orchards and vineyards and began planting more fruit crops. Between 1908 and 1912, approximately 100 acres of fruit trees were planted on the hills behind the hospital. Reaching their peak in the late 1930s and early 1940s, the orchards began producing large volumes of fruit. Intended to ease the strain associated with the harvest and processing, several buildings were constructed in the immediate vicinity of the orchards. Serving as a storage and processing center, the buildings were situated near the current location of Camp Via. As the orchards declined in the late 1950s, this cluster of orchard-related buildings was later abandoned.

The construction of Camp Via occurred almost simultaneously with the decline of the orchards. Established in 1962, Camp Via originally served as an outdoor recreational retreat for SDC hospital patients. As patient demographics began changing in the 1970s, patient populations started to decline. During this time, only the most severely disabled patients were admitted into the institution. As a result of these changes, Camp Via is no longer intensively used as an outdoor retreat by the SDC, rather it serves as an indoor day retreat, where patients can get away from the main hospital grounds for a short period of time, while still having supervision. While the function of this area has changed from orchard-related activities to recreational activities, it is important to note that the node of development itself remains extant.

Today, a large portion of the land associated with the Sonoma Developmental Center Orchard continues to function in a similar capacity. Many of the original fruit tree species are still present. While the peach trees are no longer extant, apple, apricot, cherry, pear, plum, prune and quince still exist. Actively maintained by the institution until 1966, the Sonoma Developmental Center Orchard has since fallen into disrepair but remains basically intact. Since being acquired by the Jack London State Historic Park in 2002, the orchard attracts park visitors who partake in the fruit harvest. Volunteers also trek into the orchard to prune the trees and clear brush from the grounds in an effort to maintain and preserve it from further deterioration. While changes have occurred throughout the years, including the reforestation of a few orchard areas and the die out of the peach trees, the land is still characterized by fruit trees. Therefore, reflecting a continued use of the land for the cultivation of horticultural crops, the Sonoma Developmental Center Orchard possesses integrity, illustrating that land use is a significant landscape characteristic (see figures 19 & 20).

Figure 22: Contemporary photograph of the upper orchard of the Sonoma Developmental Center Orchard showing an abandoned trailer, reminiscent of previous orchard-related land uses (*NPS PWR, 2006*).

Figure 23: Contemporary photograph showing existing prune trees in the upper orchard with Camp Via in the background. This photo reflects a mixed-use of the property—as an orchard and a recreational landscape *(NPS PWR, 2006).*

Spatial Organization

The spatial organization of the Sonoma Developmental Center Orchard retains integrity, which contributes to the site's historic significance. The orchard's overall primary spatial feature, its bi-lobed shape, is comprised of two discreet orchard areas oriented in an east/west direction. The upper orchard, also referred to as the Coon Trap Orchard, lies due west of the lower orchard. Climbing westward up the slopes of Sonoma Mountain, portions of the upper orchard sit several hundred feet higher in elevation than the lower orchard. Regardless of the difference in elevation, both of the orchard areas share a common central node of development, which played an important role in the maintenance and development of the orchard landscape through time. Historically, this node of development served as an orchard equipment storage and processing location. However, today, this developed area, known as Camp Via, serves a different function, but continues to play an important role in the spatial organization of the landscape as the central node between the two adjacent orchards.

Additionally, within each of the two orchard lobes, the fruit trees are organized by blocks of different species. Laid out perpendicular to the primary roads, many of the orchard blocks are also bound by secondary two-track roads. Planted on seedling rootstocks, the fruit trees are typical of an early 20th-century orchard, dating prior to World War II. Adhering to a standard grid spacing system, many of the trees are planted at either 22 feet by 22-feet or 30 feet by 30-feet apart. By contemporary standards, such wide spacing is not necessary because fruit trees are no longer grown on a seedling rootstock. Rather, today, fruit trees are grown on dwarf rootstocks that produce significantly smaller trees, making it less laborious to maintain and harvest the tree, but also resulting in tight tree spacing.

Today, nearly 22-acres of apple, apricot, cherry, pear, plum, prune and quince trees are represented in the upper orchard, while approximately five and one-half acres of plum trees are extant in the southeast corner of the lower orchard. Historically, there were a significant number of peach trees in both the upper and lower orchards; however, due to their short-lived nature, they no longer survive. Unfortunately, the peach trees are not the only fruit trees that have failed to endure throughout the years. Due to drought-like conditions and lack of maintenance, a large number of other species of fruit trees have perished or fallen into poor condition. Though the trees are close to one hundred years old, they are declining at an unnecessarily rapid rate. The most prevalent problems include hollow trunk cavities, loss of the live tree canopy and the encroachment of woody vegetation such as Live Oak (*Quercus agrifolia*), Coyote Brush (*Baccharis pilularis*) and non-native herbaceous plants like Yellow Starthistle (*Centaurea solstitalis*). While several blocks of trees have died over the years, in particular the short-lived peaches, the overall spatial organization of the Sonoma Developmental Center Orchard remains largely unchanged. Similar to the character of the original orchards planted between 1908 and 1912, the organization of the fruit trees

illustrate a geometric orchard structure. Furthermore, the circulation routes and the central node of development remain intact, situated in the same locations as those of the historic period. Although native woody vegetation and non-native herbaceous plants have infiltrated the orchards, the overall spatial composition of the landscape still contains two large, open tracts of land characterized by blocks of fruit trees with a central node of development (see figure 21). As a result, spatial organization is a landscape characteristic that retains integrity.

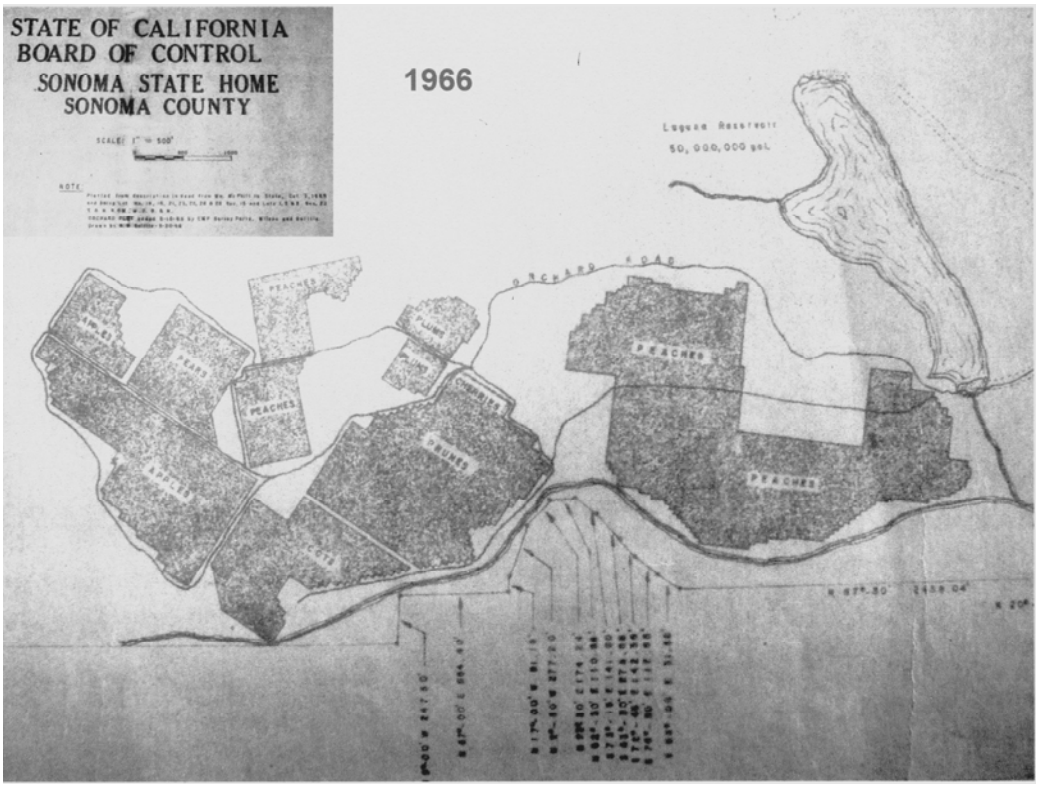

Figure 24: Historic 1966 map illustrating the location of orchard species areas in the upper and lower orchard of the Sonoma Developmental Center Orchard, when the orchard was owned by the Sonoma State Hospital (to become the Sonoma Developmental Center). The same distribution of species is still evident today, revealing that the spatial organization of the landscape is largely intact (*Sonoma Ecology Center*).

Circulation

During the historic period, the orchards associated with the Sonoma Developmental Center played an important role in the continued livelihood of the hospital. Serving as both a source of revenue and as a source of sustenance, the orchards produced a plethora of fruit that was consumed by hospital patients. Planted, harvested and maintained by SDC patients and employees, the fruit produced by the orchards allowed the hospital to remain isolated and self-sufficient. Located on the hills behind the institution, a circulation route was needed to transport employees, patients and fruit between the orchards and the hospital. In the early 1910s, Orchard Road was constructed. Over time, smaller primary and secondary two-track roads were constructed throughout the orchards to provide access for patients and employees as well as for machinery. Often separating blocks of fruit species, these roads played an integral role in the continued development and maintenance of the orchards through time. Today, the footprint of the original orchard circulation system remains extant and possesses significance as a landscape characteristic in the Sonoma Developmental Center Orchard.

Prior to the construction of Orchard Road, it is unknown how the orchards were accessed by hospital patients and employees. It is likely that a similar, more primitive route existed in the location of Orchard Road that was navigated by horses and wagons. Patients may have also walked from the hospital to the orchards. By the early 1910s, Orchard Road had been constructed allowing for easier and more efficient access to the orchards. Engineered and laid out by the home engineer and his employees, Orchard Road ascends obliquely up to the fruit trees behind the institution. Defined by a cut and fill prism, the road illustrates a degree of engineering sophistication. Paved with asphalt and nearly 18-feet wide, the road is served by culverts and stone-lined ditches that date from the historic period.

Today, Orchard Road leads to a central node of development named Camp Via. Historically, this site had a barn and storage sheds, and was associated with the storage of equipment and fruit handling. As a result of its close proximity to bearing trees, several primary and secondary two-track orchard roads radiate from this developed area. Constructed to allow for convenient access to the orchards, often these roads were utilized by horses, which pulled orchard equipment such as sprayers, plows and mowers through the orchards. (Interestingly, horses were used by the SDC exclusively until the 1920s when truck and tractor technology was adopted.) Often centrally located, these dirt roads were the principal routes through the orchards. Measuring approximately 12 feet wide, the primary orchard roads are extant today. Situated on the periphery, near the boundary between the orchard and the adjacent woodlands, these roads illustrate little engineering sophistication and are in fair condition. There is also a series of historic secondary two-track dirt roads that penetrate between orchard species areas, providing interior access to the fruit trees (see figures 25, 26 and 27).

Both the primary and secondary two-track orchard road systems remain largely intact today. While several of the secondary two-track roads have become overgrown, and one primary road has been closed due to threat of erosion, most historic roads remain open and are in excellent condition. Furthermore, Orchard Road, leading up the hill from the main hospital grounds remains intact. While historically this road was paved with gravel, the road retains the same alignment, and occupies the same bench. Significant due to their association with the working infrastructure of the orchards, the roads serve as an integral component of the historical development of the orchard landscape. Therefore, this system of roads retains integrity as the landscape characteristic of the Sonoma Developmental Center Orchard.

Figure 25: Contemporary photo of a portion of the Sonoma Developmental Center Orchard central orchard road, measuring approximately 12 feet wide (*NPS PWR, 2006).*

Figure 26: Contemporary photo of a road winding through the upper prune and apricot orchards in the Sonoma Developmental Center Orchard (*NPS PWR, 2006)*.

Figure 27: Contemporary photo of a secondary two-track road in the lower orchard of the Sonoma Developmental Center Orchard. Today, many of these secondary roads have been closed due to erosion-related concerns (*NPS PWR, 2006)*.

Vegetation

The vegetation of the Sonoma Developmental Center Orchard retains integrity, which contributes to the site's historic significance. Behind the main grounds of the Sonoma Developmental Center lay two discreet orchard areas. Characterized by blocks of fruit trees divided by woodlots and circulation routes, the upper and lower orchards of the Sonoma Developmental Center Orchard remain extant and serve as a fine example of a pre-World War II orchard. While today the fruit trees are of primary importance, several other forms of vegetation, including herbaceous orchard floor vegetation and several woodlots are also a significant part of the integrity of vegetation in the Sonoma Developmental Center Orchard (see figures 28 & 29).

The vegetation associated directly with the development of both the upper and lower orchards remains mostly intact, with a majority of the original fruit species still present. Planted between 1908 and 1912, today—nearly one hundred years later, approximately 1,300 fruit trees are still extant in the orchards. Typical in form an early 20th-century orchard, the Sonoma Developmental Center Orchard contains fruit trees grafted onto seedling rootstocks. Planted using a grid spacing system, many of the trees are either 22 feet by 22-feet or 30 feet by 30-feet apart. Generally the fruit trees are 'low-headed,' displaying a short trunk that is less than three feet tall. Additionally, the trees exhibit an open bowl scaffold, a typical pruning style for the period. Consistent with this style, most of the fruit trees have three to five scaffold limbs, depending on the size of the species and variety.

Today, apple, apricot, cherry, pear, plum, prune and quince trees are present as distinct orchard blocks, or species orchards. Historically, peach trees were also planted in the orchards, however, due to their short lifespan; this species is no longer extant in the Sonoma Developmental Center Orchard. Due to the loss of peach trees, the most obvious void in the landscape occurs in the lower orchard where peaches were the predominant fruit crop cultivated. In addition to the presence of numerous species of trees, various varieties of species are also extant. This is particularly evident in the apple and pear orchards where many varieties still exist. Apple varieties include: Alexander, Delicious (Hawkeye), Esopus Spitzenburg, Gravenstein, Jonathan, Newtown Pippin, Northern Spy, Rhode Island Greening, Winesap, Yellow Bellflower and Yellow Transparent. These apples are heirloom varieties that are generally no longer planted in commercial orchards today. Furthermore, two varieties of pears, Bartlett and Comice, still exist in the orchard as well as varieties of apricots, cherries, plums and prunes (see figures 30 -35).

In addition to the fruit trees themselves, the extant woodlots, located within the cleared areas of the orchards, and the vegetation associated with the orchard floor, also contain integrity. Presently, several woodlots remain associated with the Sonoma Developmental Center Orchard. These areas play an

important role in the spatial organization of the species orchards. Retained as the land was cleared for orchard planting during the early part of the 20th- century, these woodlots may have served a number of purposes. It is possible that the woodlots were retained to provide shade and relief to hospital patients and employees who toiled in the orchards on hot summer days. The woodlots also may have been preserved because the soils associated with these areas were too rocky to plant and support a fruit orchard. Today, the remaining woodlots contain mature Madrone (*Arbutus menziesii*), California Bay Laurel (*Umbellularia californica*) and Live Oak (*Quercus agrifolia*). In some areas, the vegetation associated with the orchard floor also retains integrity. Comprised of herbaceous vegetation, historically of grasses, today the characteristic appearance can be found among the prunes, apricots and plums. However in many areas, and in particular among the apples and pears, non-native grasses, Coyote Brush (*Baccharis pilularis*) and Poison Oak (*Toxicodendron diversilobum*) are colonizing and turning the historic low, grassy appearance of the orchard floor into tall brush.

The vegetation associated with the Sonoma Developmental Center Orchard remains recognizable today. Characterized by the presence of multiple species of fruit trees, including apples, apricots, cherries, pears, plums, prunes and quince, the overall condition of the extant fruit trees is poor. A significant percentage of the trees display hollow trunk cavities, a loss of live tree canopy, and the negative affects associated with the encroachment of vegetation, such as Coyote Brush, Yellow Starthistle and Poison Oak. Furthermore, according to historic maps, nearly half of the cleared land associated with the upper and lower orchards was originally planted to peaches. Today, all of the peach trees have been lost due to their relatively short lifespan. Regardless of these changes, the overall composition of fruit trees, woodlots and the orchard floor retain integrity. By and large, the vegetation remains similar to what was present during the historic period, 1908-1957, and as a result is significant as a landscape characteristic.

Figure 28: Contemporary photo of plum trees in the upper orchard. These living trees illustrate that vegetation (fruit trees) in the Sonoma Developmental Center Orchard retains integrity *(NPS PWR, 2006)*.

Figure 29: Contemporary photo of plum trees that are in poor condition in the lower orchard. (*NPS PWR, 2006)*.

Figure 30: Contemporary photo of a Delicious (Hawkeye) apple, reflecting one of the many different varieties of fruit in the Sonoma Developmental Center Orchard (*NPS PWR, 2006)*.

Figure 31: Contemporary photo of a cluster of early Gravenstein apples in the upper orchard (*NPS PWR, 2006)*.

Figure 32: Contemporary photo of Alexander apples in the upper orchard (*NPS PWR, 2006)*.

Figure 33: Contemporary photo of a heavily bearing Comice pear tree in the upper orchard (*NPS PWR, 2006)*.

Figure 34: Contemporary photo of prunes in the upper orchard (*NPS PWR, 2006)*.

Figure 35: Contemporary photo of a European plum borne on a tree in the upper orchard (*NPS PWR, 2006)*.

Natural Systems and Features

Numerous elements attribute to the significance of natural systems and features as a landscape characteristic. These elements, associated with the development of the Sonoma Developmental Center Orchard, include: elevation, slope, climate, geology and hydrology. Each of these elements influenced the development of both the upper and lower orchards during the historic period.

Located on the east-facing slopes of Sonoma Mountain in the Valley of the Moon, the Sonoma Developmental Center Orchard was historically located in an environment well suited to the cultivation of orchard fruit crops. Portions of the upper orchard were located at approximately 1,000 feet in elevation, while the lower orchard was planted two hundred feet lower. Protected from the summer afternoon heat, the north and east-facing slopes of the mountain support dense oak woodlands and the growth of fruit trees. By contrast, the west and south-facing slopes of Sonoma Mountain are warmer and drier, supporting fewer woodland species, leading to the presence of grassland and oak savannah. In addition, the sloping topography of the upper and lower orchards allowed for air drainage and frost protection during blossom time. Over time, the natural topography favored the survival of the fruit trees in a region with relatively dry summers.

The Jack London was planted in shallow soils with moderate to high risk of erosion. The geologic bedrock unit underlying the soil is known as Sonoma Volcanics and is characterized by soft sandstones to harder flow rocks and breccia.[88] Composed of a clay loam, the soil texture is well aerated and well drained, which allowed for the successful establishment of the fruit trees. The primary water source available was Sonoma Creek, with both the Asbury and Mill (Hill) Creeks serving as secondary drainages. In addition, several small springs provided groundwater in the orchard locale to supplement scant summer rains. Weather patterns, also favored fruit development and fruit ripening. Seasonal temperatures in the area are characterized by heat in the summer and rain in the winter. Most of the average 40-45 inches of rain per occurs in the fall through spring.[89]

Historically, these patterns of geology, hydrology, climate, elevation and slope influenced the development of the landscape immediately surrounding the SDC hospital grounds. It is likely that the orchard was planted on the eastern slopes of Sonoma Mountain because early horticulturalists in the region, such as William McPherson Hill, understood that this location was extremely favorable for the production of fruit. Following suit, the SDC successfully cultivated an orchard in this locale for nearly 60 years. It is likely that the natural systems and features of the environment played a role in the siting and layout of the orchard

[88] Rebecca Lawton and Arthur Dawson, "Historical Road Inventory," Sonoma Ecology Center, July 2005.
[89] Ibid.

and its continued longevity. Today, natural systems and features are a landscape characteristic that retains integrity of the Sonoma Developmental Center Orchard.

PART 2:

CONDITION ASSESSMENT

Introduction

The Sonoma Developmental Center Orchard at Jack London State Historic Park possesses the distinctive characteristics of a pre-World War II orchard. Planted in the early 20th-century, the orchard is defined by its historic tree form, spacing and varieties. Combined, both the upper and lower orchards contain 27-aes of full-size or standard fruit trees grafted onto seedling rootstocks. Seven species are represented by the 1,301 trees: apple, apricot, sweet cherry, European pear, European plum/prune, Damson plum and Quince.

The Sonoma Developmental Center Orchard fruit trees exhibit "low headed" trunks (less than three feet tall) and an open-bowl method of pruning, both indicative of an orchard that was planted prior to World War II (see the "Statement of Significance" and the "Physical History" in Part I for more information). The orchard was planted out by blocks of species, or species orchards, according to a standard grid. The smaller species were planted at 22 x 22-foot square spacing and the larger species at 30 x 30-foot spacing. (In historic orchards, 22 x 22-foot spacing resulted in 60 trees per acre, while 30 x 30-spacing resulted in 40 trees per acre.) Today, contemporary orchards are grown at much greater density, up to 2,000 trees per acre, with fruit trees grafted to clonal dwarfing rootstocks, rather than standard or seedling rootstocks.

Today, the overall condition of the orchard is poor. Stabilization is recommended to prevent further loss of fruit trees. Numerous trees have died, while those still alive exhibit severe problems such as trunk cavities, loss of limbs and loss of bark. In addition, pests, lack of water, encroachment of woody vegetation, diseases as well as animal and human interaction with the trees are threats to the continued livelihood of the orchard. However, it is worth emphasizing that fire blight and scale are not prevalent in any of the species orchards.

Condition Assessment Methodology

The Condition Assessment field work was performed in September and November 2006 by National Park Service Pacific West Region (NPS PWR) staff. During the condition assessment process, each tree in the upper orchard received a unique identifier according to species and location. The species and variety of each tree was identified to the extent possible, and condition was assessed as good, fair, poor or dead. The presence of a trunk cavity was recorded, along with the percent of live canopy cover and trunk diameter. In addition, the geographic coordinates of each fruit tree were identified using a handheld Global Positioning System (GPS) unit. The coordinates were processed in ARC GIS to map each fruit tree. The condition attribute data were tabulated in a spreadsheet, included in the appendix of this report. The lower orchard was assessed in November 2006 through a general reconnaissance, rather than individual tree analysis.

Definition of Condition Classes

The Sonoma Developmental Center Orchard contains approximately 1,301 fruit trees, with conditions ranging from good to poor to standing dead. Definitions of the four condition classes are provided below:

Good – Fruit tree has live limbs, continuous bark cover and solid scaffold structure. No trunk or limb cavities are present. The tree has more than 80% live canopy cover.

Fair – Fruit tree has lost some limbs including one major scaffold limb, and some bark has been lost. Some limb cavities may exist. However, the majority of limbs and trunk are sound, and at the tree has at least 40% live canopy cover.

Poor – Fruit tree exhibits a trunk cavity, loss of limbs and loss of bark. Additionally, the tree has less than 40% live canopy cover.

Dead – Fruit tree is dead, showing no live canopy in the scion (aerial parts). Only standing dead rather than fallen dead trees were documented.

Examples of Condition Classes

Figure 36: Contemporary photo illustrating an apricot tree in fair condition (*NPS PWR, 2006*).

Figure 37: Contemporary photo illustrating a plum tree in poor condition (*NPS PWR, 2006*).

Figure 38: Contemporary photo illustrating a dead plum tree (*NPS PWR, 2006*).

General Results of Condition Assessment

Historically, the upper and lower orchards of the Sonoma Developmental Center Orchard covered 100 acres of land: 60 acres in the upper orchard, and 40 acres in the lower orchard. Today, 52-acres of the upper orchard remains as cleared land, and approximately 8 acres have become reforested. In the lower orchard, 32-acres remain as cleared land and 8 acres have become reforested. In the upper orchard, 21-acres remain planted in fruit trees: apple, apricot, cherry, pear, plum, prune and quince. In the lower orchard 5.5 acres remain planted in fruit trees, all of which are European plum trees.

The following table contains the orchard species and number of acres extant today.

Common Name	Latin Name	Acreage
Apple	*Malus domestica*	4.49 acres
Apricot	*Prunus armeniaca*	1.10 acres
European Pear	*Pyrus communis*	2.14 acres
European Plum – (upper orchard)	*Prunus domestica*	3.30 acres
European Plum – (lower orchard)	*Prunus domestica*	5.58 acres
Prune	*Prunus domestica*	10.18 acres
Sweet Cherry	*Prunus avium*	.11 acres

Table 2: Acreage of fruit species remaining in the upper and lower orchards of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

The following table contains a summary of the condition of extant fruit trees found in the upper orchard.

Condition	Number of Trees	Percent (%)
Good	2	.2%
Fair	118	10.8%
Poor	631	57.9%
Dead	339	31.1%
Total	**1301**	**100%**

Table 3: Percentage of fruit trees in various condition classes in the upper orchard of the Sonoma Developmental Center Orchard *(NPS, PWR, 2006)*.

The following table contains a summary of the condition of extant plum trees in the lower orchard, within the boundaries of the Jack London State Historic Park

Condition	Number of Trees	Percent (%)
Poor	148	70%
Dead	63	30%
Total	**211**	**100%**

Table 4: Percentage of fruit trees in various condition classes in the lower orchard of the Sonoma Developmental Center Orchard – based on a general field reconnaissance rather than individual tree analysis (as in the upper orchard) *(NPS, PWR, 2006)*.

Figure 39: Site map showing the location of species blocks in the upper orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

Figure 40: Site map showing the location of the remaining species block in the lower orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

CONDITION ASSESSMENT OF SPECIES ORCHARDS

Apple (*Malus domestica*) – Condition Assessment

A total of 106 apple trees were documented in two areas within the upper orchard.

Condition	Number of Trees	Percent (%)
Good	0	0%
Fair	29	27%
Poor	71	67%
Dead	6	6%
Total	**106**	**100%**

Table 4: Percentage of apple trees in various condition classes within the upper orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

Variety	Number of Trees	Season of Ripening
Alexander	4	Early
Delicious (Hawkeye)	6	Late
Esopus Spitzenburg	8	Late
Gravenstein	20	Early
Jonathan	5	Mid
Newtown Pippin	8	Late
Northern Spy	11	Late
Rhode Island Greening	2	Late
Winesap	14	Mid
Yellow Bellflower	1	Mid
Yellow Transparent	5	Early
Unidentified	22	Early, Mid

Table 5: Quantity of apple trees of varieties found in the upper orchard of the Sonoma Developmental Center Orchard with variety ripening period. *(NPS, PWR, 2006)*.

The apple trees were planted at 30 feet by 30-feet spacing in a square grid system. All the apple trees were grafted onto a seedling rootstock (rather than a clonal and/or dwarfing rootstock). Eleven apple varieties could be identified. However, it is likely that more varieties exist (but were not bearing fruit) and that even more varieties were grown in the orchard historically.

The form of the apple trees is "low headed", with trunks shorter than three feet tall. Historically, the trunk height would have been created in the nursery, or when the trees were first planted out. Additionally, the trees exhibit an open-bowl pruning style that would have been established through regular pruning in the first five years of each tree's life. Trunk diameter ranged from eight inches to as large as 32 inches, depending on the variety, with the average being 18 inches. The trees with the naturally smallest trunk diameter are the Northern Spy and Winesap apple varieties. Gravenstein, Newtown Pippin and Esopus Spitzenburg are naturally large-sized tree varieties. The trees with a smaller trunk diameter are uniformly in better condition than the other apple varieties found in the orchard. Generally, the small-sized tree varieties, such as the Northern Spy, Winesap are trained to have five scaffold limbs, while the large sized varieties have three limbs, as five would have become overcrowded.

The apple trees range between poor and fair condition, with most trees displaying the onset of mortality. Without intervention, the majority of the apple trees will be dead within ten years. The trees are moderately to highly stressed and show indications of pest and disease problems. Leaf roller, flea beetle, sawfly, codling moth and aphid damage are the primary pest problems. The trees also demonstrate evidence of insufficient water, which serves as a stressor to the trees. Drought is visible as dead leaves, shoots and branches, and is responsible for loss of bark, along with sunscald damage. Many apple trees exhibit limb deterioration and loss of bark. Additionally, almost all of the apple trees have trunk cavities due to drought or disease. Rootstock sprouts and branches are found at the base of many apple trees, with some of the rootstock sprouts overtaking the existing crown with large branches and producing their own canopy cover. On average, the percent of canopy cover of the scion is 35%; however, in general, canopy cover ranges from 1% to as high as 85%.

Other stressors associated with the apple orchard include reforestation or native plant encroachment by Live Oak, Madrone, California Bay Laurel, Coyote Brush and Poison Oak. Much of the orchard floor in both apple orchard areas has been colonized by these woody plants. In addition, there is evidence of deer, vole, pack rat and jackrabbit in the orchard. Several apple trees have been damaged by deer rubbing their antlers against the trunks and low-lying scaffold limbs. Vole burrows also exist near the base of trunks. On numerous occasions, pack rat *(Neotoma fuscipes)* nests have been built within hollow trunks. Finally, there are visible traces of human visitors in social trails running through the orchard. Canopy damage to the trees is evident from visitors attempting to harvest fruit.

Description of Apple Varieties

All of the varieties found in the two apple orchard areas are 19th-century varieties, which were commonly grown in California in the late 19th and early 20th-centuries. Today, only a handful of these varieties are commercially grown in California, and several are considered unusual in the United States. The following text provides a brief description of these varieties.

Alexander: Of Russian origin, this tree was brought to the United States in the early 19th-century as an attempt to find an apple variety that was both winter-hardy and suitable for commercial production. When mature, the fruit is large in size and characterized by a thick, tough green skin that is largely covered with red stripes. The flesh is white in color and is firm. Generally, this variety ripens in August and is not a good keeper. It is considered an unusual variety today.

Delicious (Hawkeye): The Delicious or Hawkeye variety, today referred to as Red Delicious, was a chance seedling discovered in 1868 by an Iowa apple grower. Not popularized until the 1920s, this variety is characterized by a thick red skin, with darker red streaks, elongated shape and five nodes on the bottom. Its flesh is white in color and it has a crisp texture. Ripening in October, this apple variety is best for eating raw, rather than cooking.

Esopus Spitzenburg: Originating in New York State in the 1700s, this apple is fabled as a favorite of Thomas Jefferson. The fruit is medium to large in size and has a bright red skin mixed with splashes of orange. The flesh is crisp and aromatic with hues of yellow. This variety generally ripens in October and can be used for cooking, eating or making cider. Spitzenberg is the parent of the Jonathan variety, and is considered an unusual variety today. The variety is not grown commercially and is considered a collector's apple.

Gravenstein: Of European origin, this apple variety was brought to the United States in the 1820s by Russian settlers moving to California. Characterized by a lopsided or oblong shape, the fruit has a bright yellow skin that is accentuated with an orange-pink blush and light red stripes. The flesh is yellow in color and crisp. This apple ripens in August and is not a good keeper. It is considered best for cooking. Gravenstein is still a relatively common variety in home orchards or fruit gardens and has limited commercial acreage in California.

Jonathan: Originating as a seedling of the Esopus Spitzenburg in New York State in 1826, this apple still remains an important commercial variety today. Widely adapted and quite hardy, the fruit is often medium in size and is covered with a tough yellow skin that is largely covered with dark red. Flesh is white in color and very juicy. Ripening in September and October, these apples keep well.

Newtown Pippin: Originating in New York State in the early 19th-century, this variety is recognized as both the Green Newtown Pippin and the Yellow Newtown Pippin. It is likely that one of these varieties is the originator of the other; however, it is unknown which came first. Today, the Yellow Newtown Pippin is the better-known variety. This apple is large and yellow in color with a trace of pink appearing at the stem end. The flesh is yellow and firm. A good storage apple, this variety ripens in October and will keep until February or later. It was used historically for cider as well as cooking and eating. Today it has very limited commercial acreage and is considered somewhat unusual.

Northern Spy: An apple of northern heritage, the Northern Spy originated in New York State around the turn of the 19th-century. After its introduction, this variety became widely popular in numerous regions across the United States; however, it attained its greatest potential as a mountain grown apple. This apple is characterized by its large, round shape and thin, dark red skin on green. Its fine-grained, white flesh is tender, crisp and juicy. Ripening in October, this late apple can be used for cooking or eating and is an excellent keeper. Northern spy is still grown commercially, particularly in colder regions of the United States. It is considered relatively common.

Rhode Island Greening: This American apple variety originated in 1650 at Green's End, Newport, Rhode Island. By the end of the 19th-century, it was one of the most popular commercially grown apples in New York State. Comparable to a Granny Smith, this apple is generally large in size and uniformly round in shape with flat ends. It is defined by its green skin, which turns a greenish-yellow color when mature. Its yellow flesh is crisp and the flavor is tart. Ripening in September to October, this variety is an excellent cooking and cider apple and a good keeper. Rhode Island Greening has commercial acreage in the Northeastern United States, but is unusual on the West Coast.

Winesap: Originating in New Jersey in the early 19th-century, this apple is known for its spicy, tart flavor, which made this variety a popular cider apple. Fruit is medium in size and has a dark yellow skin that is largely covered with a deep black red coloration. Its flesh is yellow and crisp. Ripening in October, this variety is also good for cooking or eating and keeps well. Winesap has limited commercial acreage throughout the United States; and is considered somewhat unusual.

Yellow Bellflower: An apple originating in New Jersey in the 18th century, the Yellow Bellflower is characterized by its lemon yellow skin and light pink striping. Of medium to large size, its white flesh is firm and crisp, while the flavor is sweet offset with a hint of tartness. Best for cooking and as a cider ingredient, this apple ripens in September and October. Be sure to shake this apple to hear the hollow rattle of seeds inside. Yellow Bellflower is no longer grown commercially due to its poor keeping qualities. It is considered unusual to rare.

Yellow Transparent: Of Russian origin, this apple was introduced into the United States by the United States Department of Agriculture (USDA) in 1870. Fruit is medium to large in size with pale greenish-yellow skin. Flesh is white and crisp with a tart flavor. Ripening in August, this apple is good for cooking; however, it is does not keep well. Yellow Transparent is no longer grown commercially due to its poor keeping qualities. It can be found in home orchards and is considered unusual.

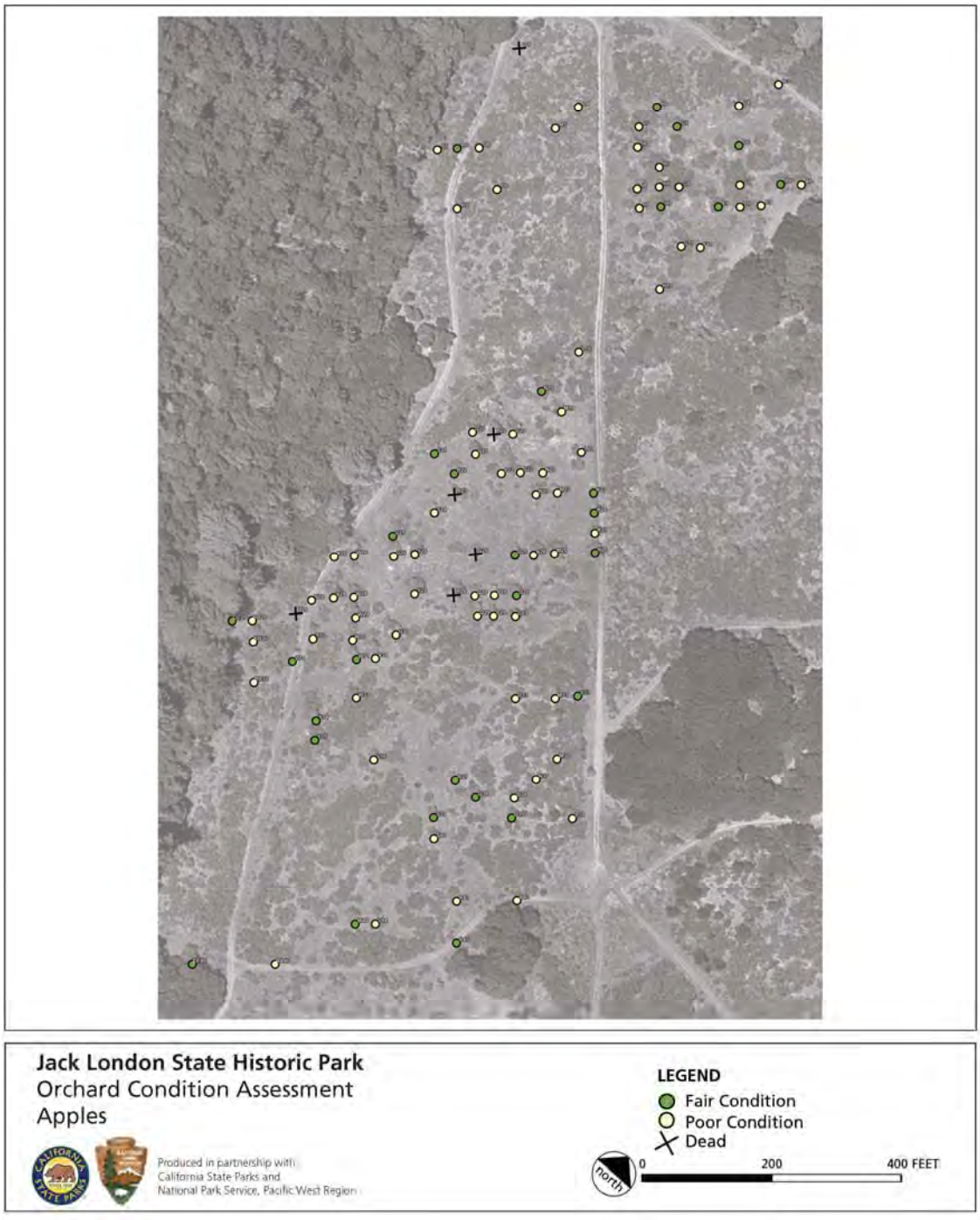

Figure 41: Site plan showing the distribution and condition of apple trees in the upper orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

Apple Varieties

Figure 42: Contemporary photo showing a cluster of Winesap apples (*NPS PWR, 2006*).

Figure 43: Contemporary photo showing a Yellow Transparent apple (*NPS PWR, 2006*).

Figure 44: Contemporary photo showing a cluster of Gravenstein apples (*NPS PWR, 2006*).

Pack Rat Infestation

Figure 45: Contemporary photo showing a pack rat rest high in the canopy of an apple tree (*NPS PWR, 2006*).

Figure 46: Contemporary photo showing a pack rat nest constructed inside the hollow cavity of a fruit tree (*NPS PWR, 2006*).

Quince (*Cydonia oblonga*) – Condition Assessment

A single Quince tree was documented in the orchard. Located at the southern edge of the upper European plum orchard, near the forest, this tree is in good condition. Free from trunk and limb cavities, the tree has an 80% live canopy cover. Furthermore, the tree is low-headed, with five scaffold limbs and has an open-bowl form. Producing a bright yellow fruit, the flavor of a Quince is reminiscent of an apple and a pear combined. This fruit is excellent when used for cooking; however, it cannot be consumed raw.

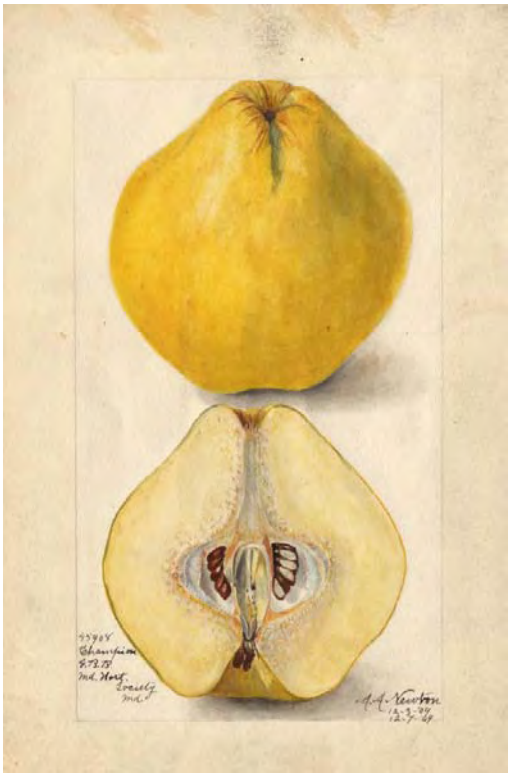

Figure 47 . Watercolor image of a Quince fruit. (USDA Historic Fruit Watercolor Collection)[90]

[90] USDA Pomological Watercolor Collection," < http://www.ars-grin.gov/cor/pwc.html> October 12, 2006.

Apricot (*Prunus armeniaca*) – Condition Assessment

A total of 67 apricot trees were documented in the upper orchard. Located between the European plum orchard area and the prune orchard area, the apricot trees are planted on sloping topography that is well drained. Overall, the trees located on the slope were dead or in poor condition, while the best survivorship occurred on lower ground. This could potentially be attributed to a lack of water due to greater drainage on the slope. The following table contains a summary of the condition of the apricot trees.

Condition	Number of Trees	Percent (%)
Good	0	0%
Fair	8	12%
Poor	17	25%
Dead	42	63%
Total	**67**	**100%**

Table 6: Percentage of apricot trees in various condition classes within the upper orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

The apricot trees were planted at 22 x 22-feet spacing on a square grid. The form of the trees is characterized by a "low-headed" shape with trunks generally shorter than three feet tall. Additionally, the trees have an open-bowl pruning style with three major scaffold limbs. The trunk diameter ranged between 16 and 20 inches. The variety could not be positively identified due to the absence of fruit; however, it is most likely that the Moorpark or Royal Blenheim varieties are present, as these were the two dominant apricot varieties grown in California before World War II.

The apricot trees are highly stressed and show indications of pest and disease problems and a lack of water. Without intervention, the majority of the remaining apricot trees will be dead within five years. Leafhopper, flea beetle and aphid damage are the primary pest-related problems, while rust fungus, bracket fungus and orange-colored gummosis fungus were also found on the apricot trees.

The apricot trees are generally in poor condition. Missing scaffold limbs and loss of bark are prevalent. There is also evidence of branch and trunk cavities; however, this is not widespread. Live apricot trees

have a 35-40% live canopy cover. No evidence of root suckers was found among the apricot trees, which is positive for the survival of the scion, or aerial parts of the tree.

Other stressors associated with the apricot orchard include reforestation and native plant encroachment by Live Oak, Madrone, California Bay Laurel and Coyote Brush. Yellow Starthistle and tall grasses on the orchard floor compete with the apricot trees for water and nutrients. Gopher burrows are evident at the base of the apricot tree trunks. Two pieces of old equipment are extant within the apricots, including an oil drum and a trailer.

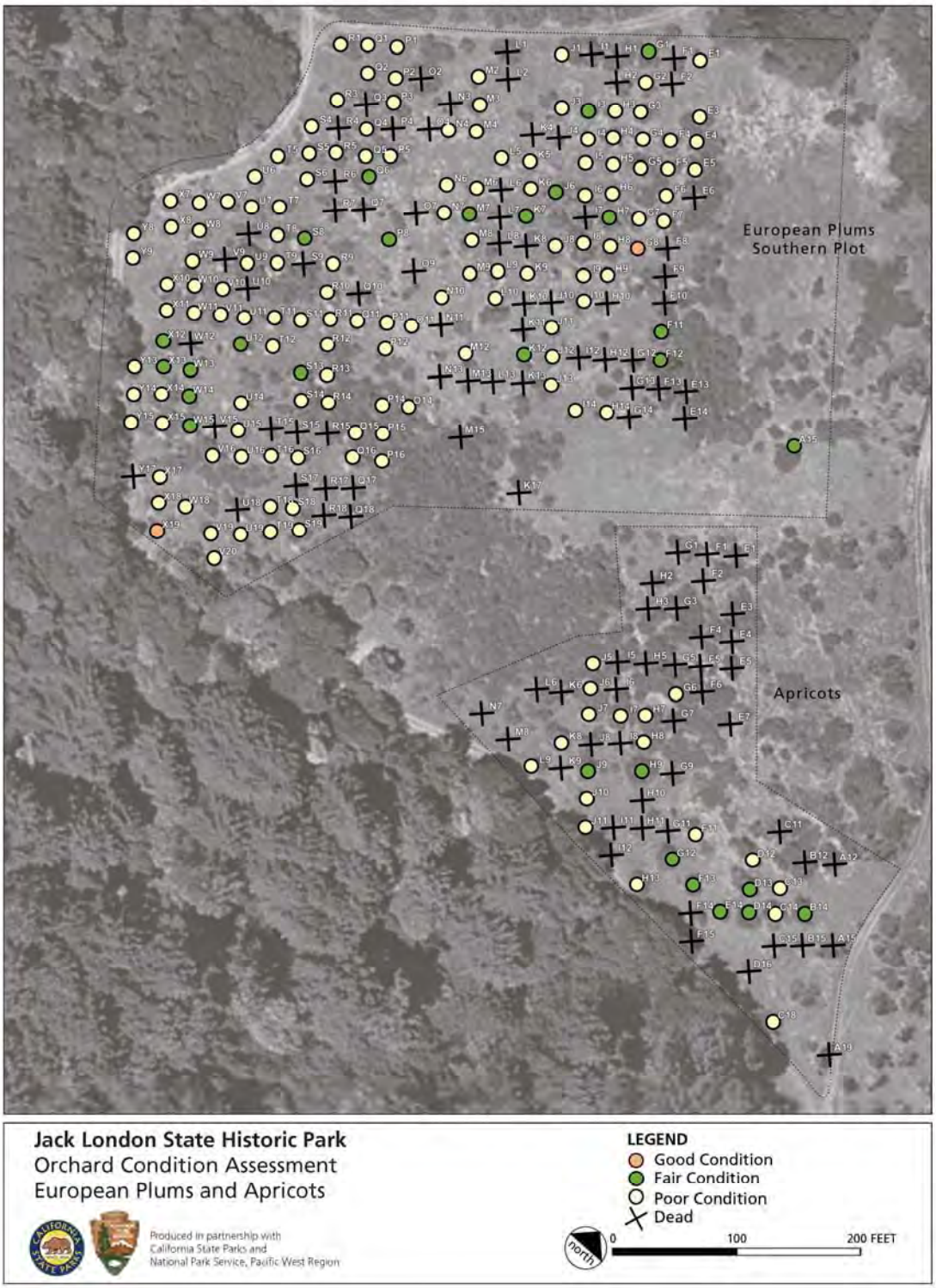

Figure 48: Site plan showing the distribution and condition of apricot trees in the upper orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

Sweet Cherry (*Prunus avium*) – Condition Assessment

A total of eight sweet cherry trees were documented in the upper orchard. Located north of the prunes, the cherry orchard was planted on rolling topography. No cherry trees are in good or fair condition; rather the trees are either in poor condition or dead. The following table contains a summary of the condition of the cherry trees.

Condition	Number of Trees	Percent (%)
Good	0	0%
Fair	0	0%
Poor	5	67%
Dead	3	33%
Total	**8**	**100%**

Table 6: Percentage of sweet cherry trees in various condition classes in the upper orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

Growing on a Mazzard seedling rootstock (rather than a Mahaleb or clonal dwarfing rootstock), these trees produce a sweet rather than a sour cherry. While the trees lacked fruit and could not be positively identified by variety, it is likely that the trees are Bing or Black Tartarian varieties, as these were commonly planted in California prior to World War II. With most cherry trees missing from the orchard, the original spacing cannot be definitely determined. However, it is likely that historically the trees were spaced approximately 22 feet by 22-feet apart in a square grid. The form of the trees is "low headed", with trunks shorter than three feet tall. Additionally, the trees have an open-bowl pruning style. The tree truck diameter averaged 32 inches.

The sweet cherry trees are in poor condition, and several are standing dead. The trees have a very low percentage of live canopy cover, ranging from 5% to 35%. Without intervention, the few remaining sweet cherry trees will be dead with three to five years. Loss of limbs and bark, dead limbs and trunk cavities were predominant features among the cherry trees. The trees also have severe aphid damage and insufficient water, which serve as stressors to the trees. Other stressors include reforestation by woody native plants such as Live Oak, Madrone, California Bay Laurel and Coyote Brush. Tall grasses and Starthistle were also significant competitors on the orchard floor.

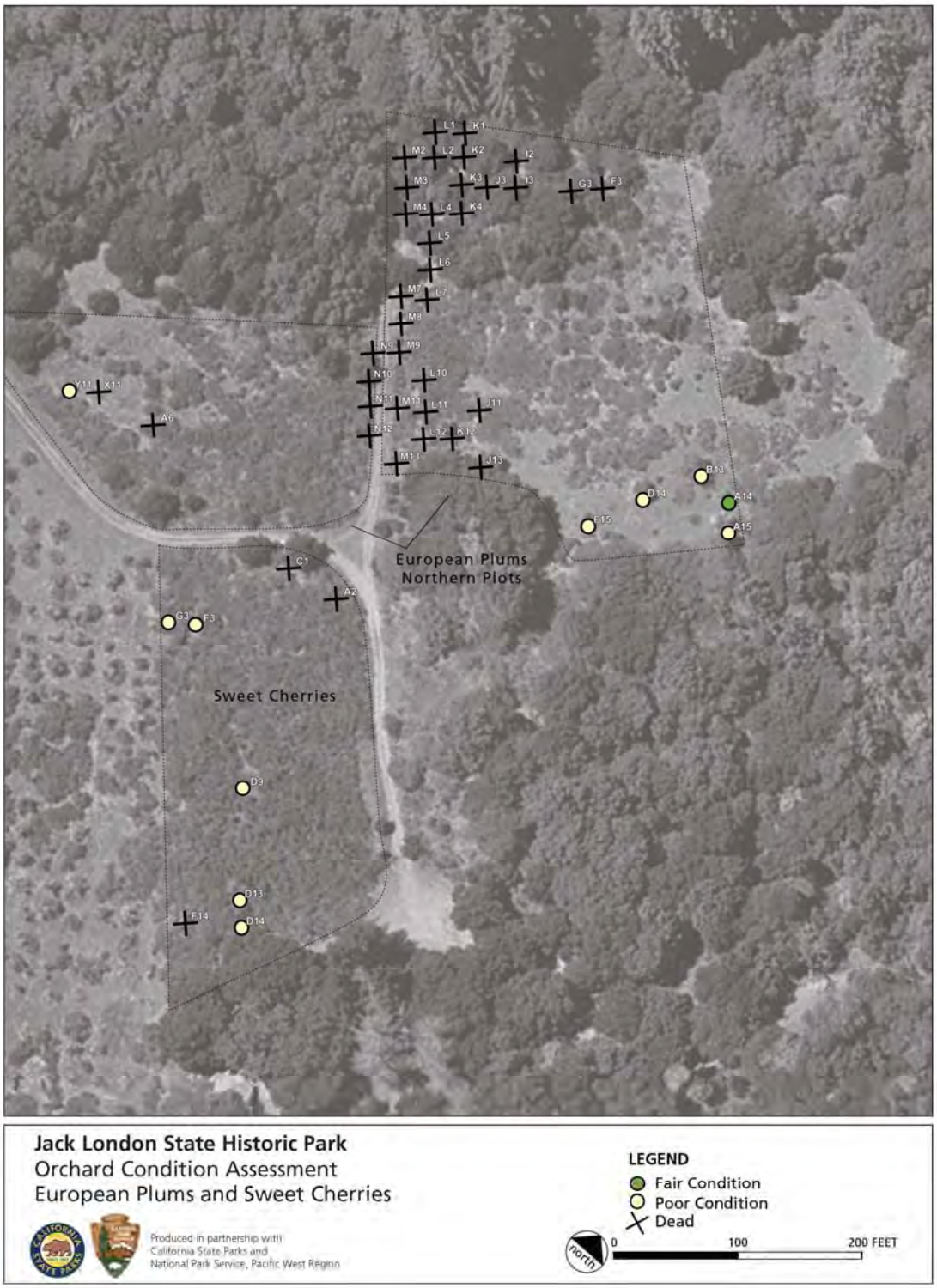

Figure 49: Site plan showing the distribution and condition of sweet cherry trees in the upper orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

European Pear (*Pyrus communis*) – Condition Assessment

A total of 81 pear trees were documented in the pear orchard. Located between two substantial apple orchard areas, the pear orchard was planted on a relatively flat area of land. Grafted to a seedling rootstock, the majority of the trees are of the Bartlett variety. However, a few trees are the Comice variety, which were grafted onto a Quince rootstock. As a very large tree-sized variety, Comice was historically grown on Quince in California to reduce the massive size to more of a Bartlett-sized tree. The following table contains a summary of the overall condition of the European pear trees.

Condition	Number of Trees	Percent (%)
Good	0	0%
Fair	29	36%
Poor	43	53%
Dead	9	11%
Total	**81**	**100%**

Table 7: Percentage of pear trees in various condition classes in the upper orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

The pear trees were planted at 30 feet by 30-feet spacing in a square grid. The form of the tree is "low headed", with trunks shorter than three feet tall. The trees have an open-bowl pruning style. The trunk diameter ranges from five inches to as large as 20 inches, with the approximate average being 12 inches. Graft unions are visible in some trees at the swollen rootstock crown.

At the south end of the pear orchard near the central road, a different spacing is seen that resembles a square with a tree in the center. This orchard layout was fashionable in the early 20th-century, and is known as the quincunx. The pear orchard was transformed into a quincunx layout near the central road when in-fill planting occurred after the original planting. The central trees are smaller in diameter and younger in age than the four trees at the corner of the square layout. Bartlett or Seckel pear trees constituted the in-filled varieties, which were planted in the 1950s or 1960s. These trees were grafted onto seedling rootstock. Today, they measure approximately eight to ten-inches in trunk diameter. The presence of pears

with a five to six-inch trunk diameter in this same area also suggests that additional trees were in-filled in the 1970s using a pear variety on a Quince rootstock, resulting in a dwarf tree.

The pear trees are in fair to poor condition. Without intervention, the extant pear trees will be dead within 10-15 years. The trees are moderately stressed and show indications of pest and disease problems. Evidence of psyllid, leaf roller and flea beetle damage are the primary pest-related problems. The trees also have aphid damage and insufficient water, which serve as stressors to the trees. Many pear trees had branch and trunk cavities and while they also show a loss of limbs and bark, this is not a serious problem. Rootstock sprouts and branches are found on many pear trees, with some of the rootstocks overtaking the existing scion crown and producing their own canopy cover. Generally, the percent of canopy cover from the scion averages 40%; however, the overall canopy cover ranges from 5% to as high as 80%.

The pear orchard revealed evidence of more recent maintenance-related activities. In one tree, a rock plug was used to fill a hollow area in the trunk crown. The rock plugged a hole and preserved the tree from rapid deterioration. Rock plugs were also seen in the European plum and apple trees. Another pear tree had received heading back pruning, seen as large cuts to major limbs high in the tree. Other stressors found in the pear orchard included reforestation by woody native plants such as Live Oak, Madrone, California Bay Laurel and Coyote Brush. Yellow Starthistle and tall grasses are competition on the orchard floor. In addition, numerous pack rat nests are found situated inside or near hollow pear tree trunks and are a significant threat to the vitality of the pear trees in the orchard due to their predation on young shafts.

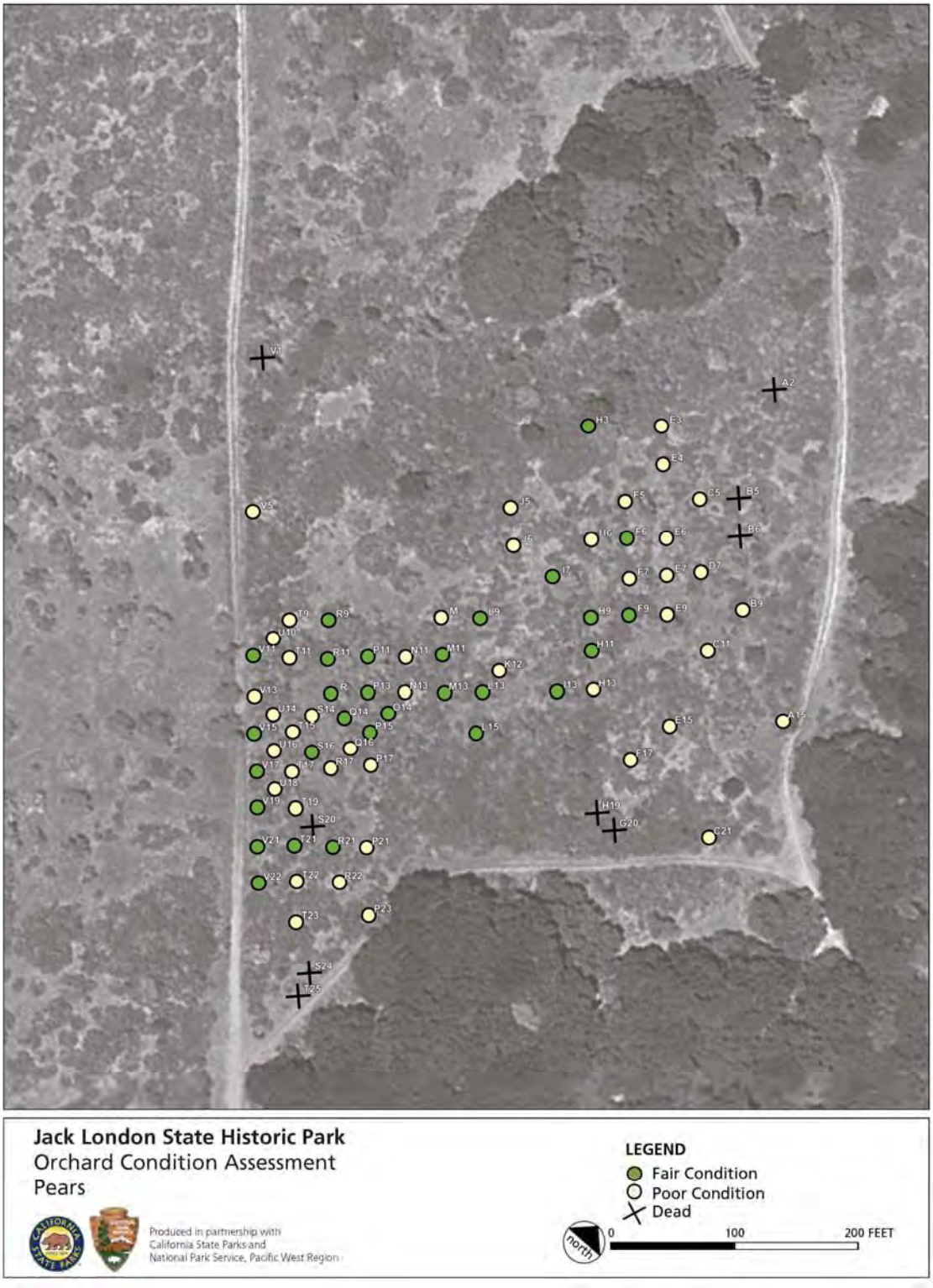

Figure 50: Site plan showing the distribution and condition of European pear trees in the upper orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*..

Pear Varieties

Figure 51: Contemporary photo showing two Comice pears (*NPS PWR, 2006*).

Figure 52: Contemporary photo showing a Bartlett pear (*NPS PWR, 2006*).

Evidence of Maintenance and Repairs

Figure 53: Contemporary photo of a metal brace installed to prevent scaffold limbs from splitting apart. The brace is approximately thirty years old (*NPS PWR, 2006*).

Figure 54: Contemporary photo showing a rock plug in a pear tree cavity installed to slow crown rot (*NPS PWR, 2006*).

Figure 55: Contemporary photo showing a pear tree that has been headed back in recent years (*NPS PWR, 2006*).

European Plum (*Prunus domestica*) – Condition Assessment

Approximately 252 plum trees were documented in two different areas of the upper orchard, which included a total of 247 Large Leafed European plum trees (*Prunus domestica*) and five Damson plum trees (*Prunus institia*). The first plum area is located between the apricot and apple trees on the southern side of the orchard, while the second plum area is located near the remains of the sweet cherry orchard in the northern reaches of the orchard. In addition, approximately 5.5 acres of European plum trees are extant in the lower orchard, as a separate entity from the two upper orchard areas mentioned above. The following table contains a summary of the overall condition of the European plum trees located within the boundaries of the upper orchard in the Jack London State Historic Park.

Condition	Number of Trees	Percent (%)
Good	1	.4%
Fair	19	7.7%
Poor	128	51.8%
Dead	99	40.1%
Total	**247**	**100%**

Table 8: Percentage of European plum trees in various condition classes in the upper orchard (southern and northern areas) and in the lower orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

The lower orchard contains approximately 211 plum trees within the boundaries of the state park and therefore within the Sonoma Developmental Center Orchard. Also, 65 additional plum trees are associated with the lower orchard outside of the park boundary, and are owned by the Sonoma Developmental Center. While the upper orchard plum trees vary from good to poor to dead condition, the fewer, lower orchard plum trees are generally in poor or dead condition. Limitations to the project scope prevented a GPS survey of the plum trees in the lower orchard. Instead, a general reconnaissance survey revealed that approximately 70% of the lower orchard plum trees were in poor condition and 30% are standing dead. This orchard has received less maintenance since the end of the period of significance (1957) than the upper orchard, and it is therefore more overgrown with re-colonizing vegetation.

The following table contains a summary of the overall condition of the European plum trees located within the boundaries of the lower orchard in the Jack London State Historic Park.

Condition	Number of Trees	Percent (%)
Poor	148	70%
Dead	63	30%
Total	**211**	**100%**

Table 9: Percentage of European plum trees in various condition classes in the lower orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

Grafted onto a seedling rootstock of cherry plum, *Prunus cerasus* (also known as Myrobalan plum) the majority of the plum trees in the upper and lower orchards are of the Lombard Group of European plum varieties. These plums are characterized by large, red or pink oval fruit. A few trees of the Damson or Small-Leafed European plum species were also present, grafted onto a Myrobalan rootstock. The following table contains a summary of the overall condition of the Damson plum trees located within the boundaries of the upper orchard in the Jack London State Historic Park

Condition	Number of Trees	Percent (%)
Good	0	0%
Fair	2	40%
Poor	3	60%
Dead	0	0%
Total	**5**	**100%**

Table 10: Percentage of Small-Leaved European plum trees (Damson) in various condition classes in the upper orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

The plum trees were planted at 22 feet by 22-feet spacing on a square grid. The form of the plum trees is "low headed", with trunks shorter than three feet tall. The trees exhibit an open-bowl pruning style with four major scaffold limbs and acutely ascending branch crotches. The trunk diameter ranges from eight inches to 24 inches, with the approximate average being 15 inches. Generally, the percent of live canopy cover from the scion averages 25-30%; however, the overall canopy cover has a large range from 1% to as high as 75%.

The plum trees are severely stressed and are in generally poor condition. Without intervention, the majority of the plum trees will be dead within five years. Many plum trees have limb and trunk cavities. Furthermore, a large number of the trees have dead limbs or branches and also have experienced limb loss. Numerous trees had received metal bracing, at least 30 years ago and are still evident today. Rootstock sprouts and branches are visible near the base of the plum trees. In one tree, the scion or aerial parts had completely died out and had been replaced by branches from the rootstock. With the rootstock fully exposed as a canopy, the tree's identity now appears as a cherry plum (*Prunus cerasus*) or sour cherry tree.

The trees have pest and disease-related problems. Leafhopper, flea beetle and aphid are the primary pest-related issues, while rust fungus, bracket fungus and colorless gummosis are disease problems. In addition, the trees are stressed by insufficient water, manifested in dead leaves and shoots. A considerable amount of lichen and moss has colonized on the plum trees, indicative of their vitality. Other stressors to plum orchard areas include reforestation by woody native plants such as Live Oak, Madrone, California Bay Laurel and Coyote Brush. Yellow Starthistle and tall grasses are competitors on the plum orchard floor.

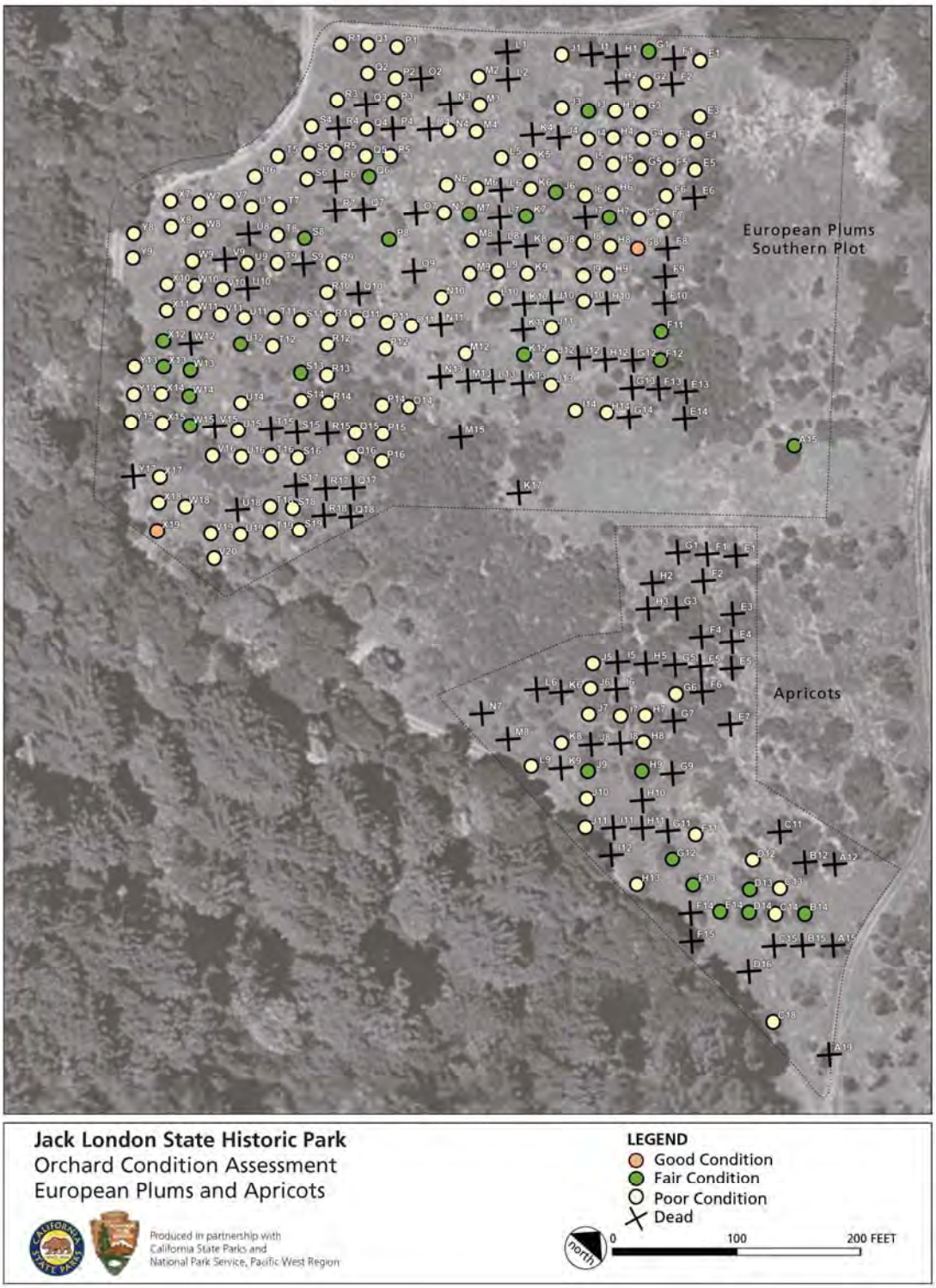

Figure 56: Site plan showing the distribution and condition of the southern area of European plum trees in the upper orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

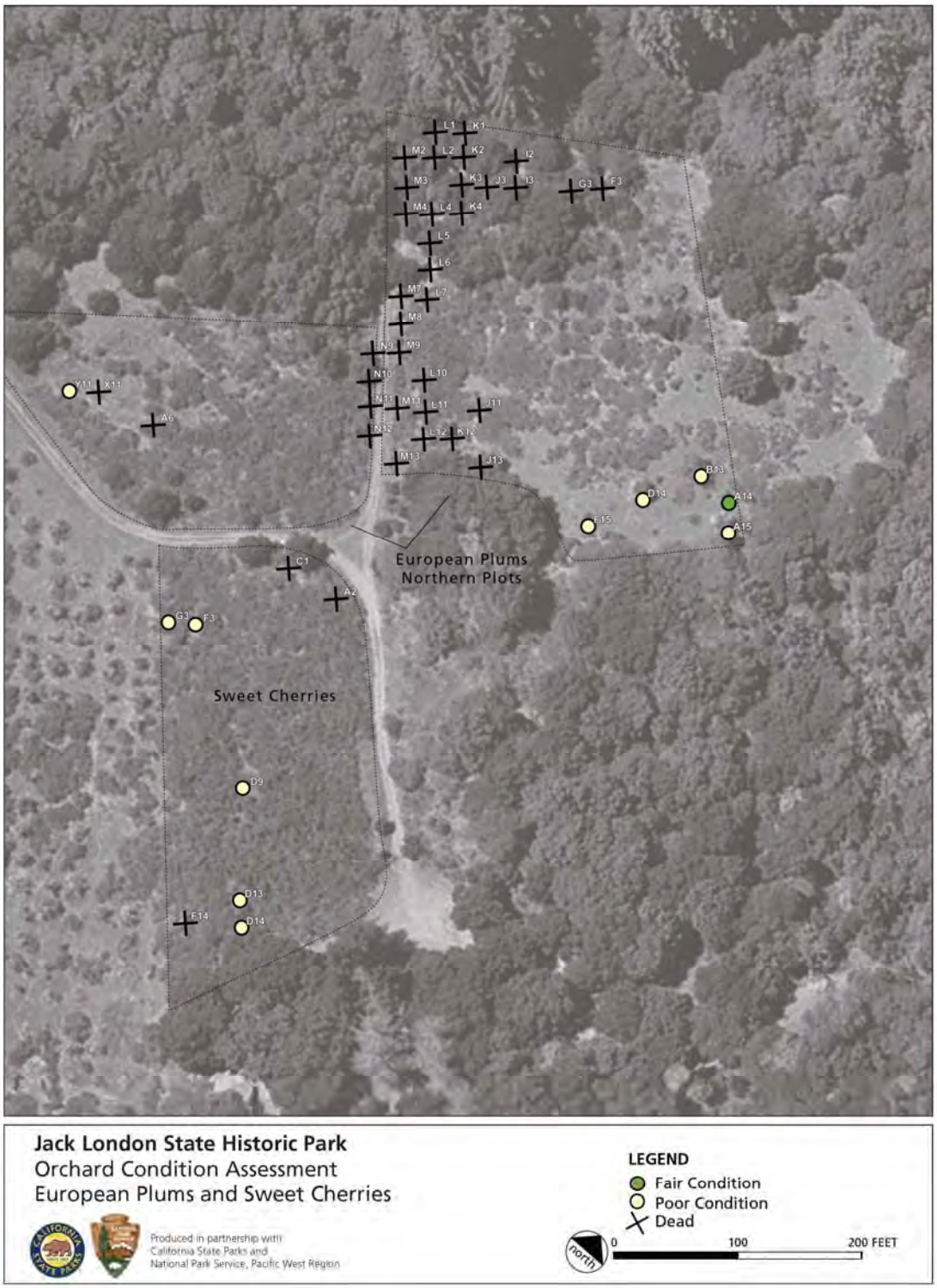

Figure 57: Site plan showing the distribution and condition of the northern area of European plums in the upper orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

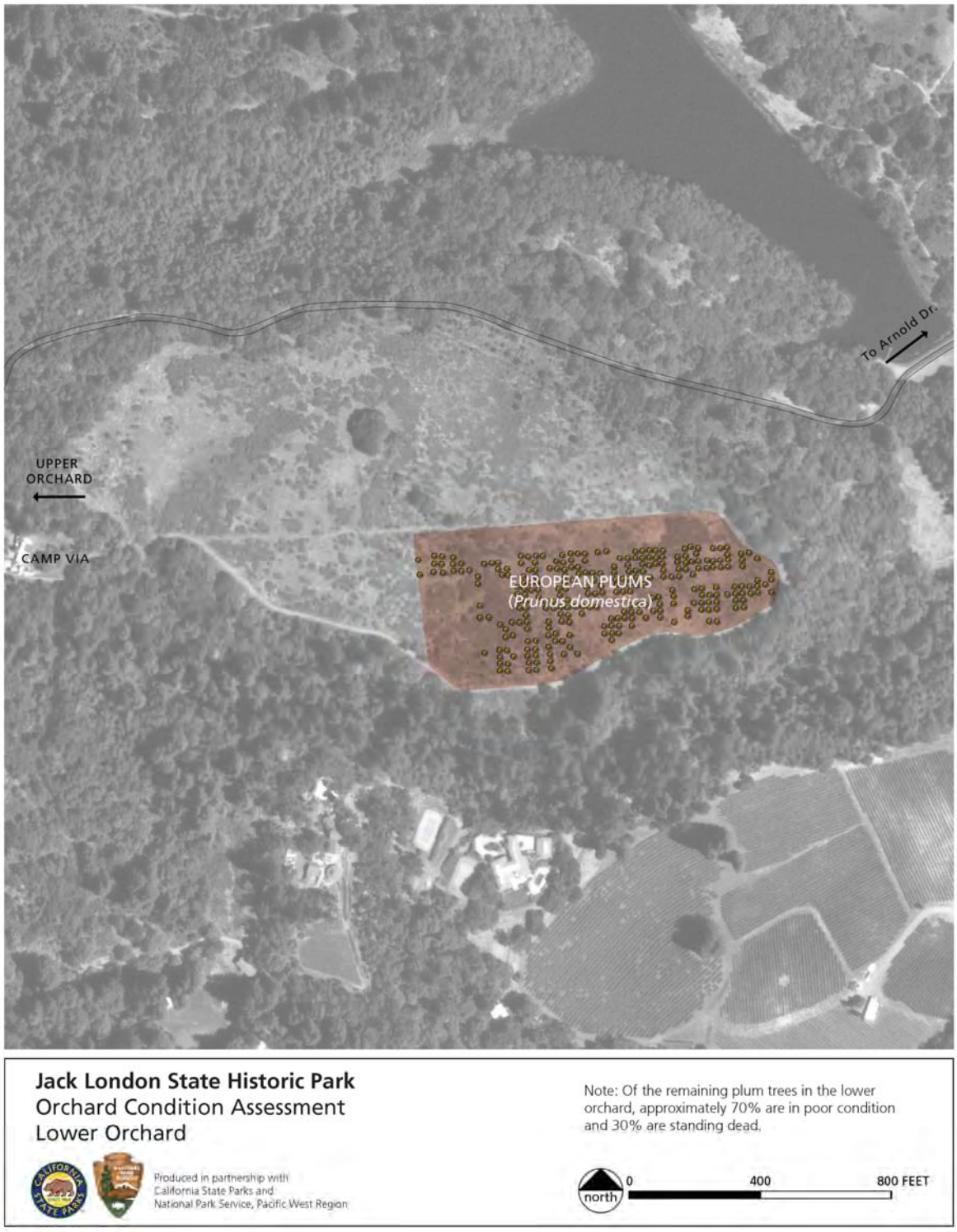

Figure 58: Site plan showing the distribution of European plum trees in the lower orchard of the Sonoma Developmental Center Orchard, including trees in poor condition and those standing dead *(NPS, PWR, 2006)*.

Prune (*Prunus domestica*) – Condition Assessment

A total of 574 prune trees were documented in the upper orchard. Situated near the apricot trees and Camp Via, the prunes are the most visible and accessible species orchard within the upper orchard. The following table contains a summary of the overall condition of the prune trees.

Condition	Number of Trees	Percent (%)
Good	0	0%
Fair	31	6%
Poor	363	63%
Dead	180	31%
Total	**574**	**100%**

Table 11: Percentage of prune trees in various condition classes in the upper orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

Overall, the prune trees growing on the greatest slope are leaning and in poor condition, while the greatest vitality occurs in trees on low, flatter ground. This is possibly due to a lack of water and more excessive drainage on the slope. Grafted onto *Prunus cerasus* rootstocks, the extant prune trees are either of the "French" or "Italian" varieties.

The prune trees were planted at 22 feet by 22-feet spacing on a square grid. The form of the trees is "low headed", with trunks shorter than three feet tall. Additionally, the prune trees exhibit an open-bowl pruning style with acutely ascending branch crotches. Three major scaffold limbs were typical when the trees were young. Now, many of the trees have lost at least one scaffold limb. Trunk diameter ranges from six inches to as large as 24 inches, with the average being 14 inches. Generally, the percent of live canopy cover averages 25%-30 %; however, the overall live canopy cover ranges from 1% to 60%.

The prune trees are severely stressed and are in generally poor condition. Without intervention, the majority of the extant prune trees will be dead within five years. A large number of prune trees have dead limbs or branches and also have experienced limb loss. In addition, several trees had received metal bracing at least 30 years ago that is still evident today. Numerous suckering rootstocks or sprouts are at the base of many prune trees. In many cases, rootstocks have overtaken the scion creating a new canopy of a seedling, rather than a variety tree.

The prune trees have pest and disease problems. Leafhopper, aphid and flea beetle are the primary pests, while rust fungus, bracket fungus and orange-colored gummosis are the major disease organisms. The trees also demonstrate evidence of insufficient water in dead leaves and shoots. Other stressors associated with the plum orchard area include reforestation by woody and herbaceous plants, including Live Oak, Madrone, Yellow Starthistle and California Bay Laurel. Tall grasses are competitors on the orchard floor. Gopher burrows are also evident at base of prune tree trunks.

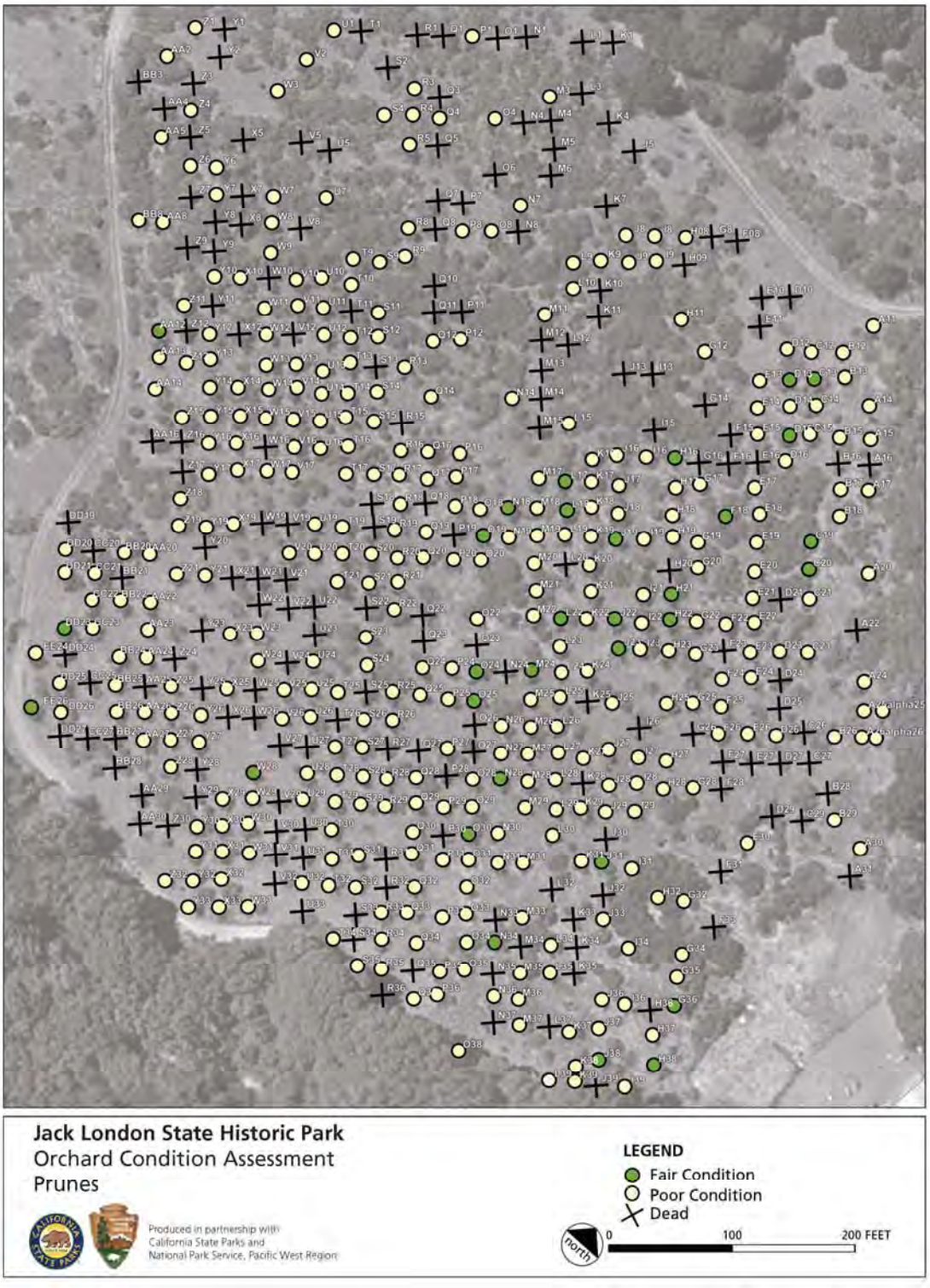

Figure 59: Site plan showing the distribution of prune trees in various condition classes in the upper orchard of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

Plum and Prune Fruits

Figure 60: Contemporary photo showing a European plum (*NPS PWR, 2006*).

Figure 61: Contemporary photo showing a prune (*NPS PWR, 2006*).

SUMMARY OF ORCHARD HEALTH PROBLEMS

Orchard Health Problems and Stressors		
Fruit Species	**Health Problems**	**Health Stressors**
Apple	Apple Aphid, Leaf Roller, Flea Beetle, Codling Moth, Sawfly	Vegetation encroachment, lack of water, trunk cavities, pack rat nests, rootstock sprouts, animal and human damage
Apricot	Leaf Hopper, Flea Beetle, Rust & Bracket Fungus, Gummosis	Vegetation encroachment, lack of water, trunk cavities
Cherry	Aphids	Vegetation encroachment, lack of water, trunk cavities
Pear	Psyllid, Leaf Roller, Flea Beetle, Aphid	Vegetation encroachment, lack of water, trunk cavities, pack rat nests, rootstock sprouts
Plum	Leaf Hopper, Flea Beetle, Aphid, Rust & Bracket Fungus, Gummosis	Vegetation encroachment, lack of water, trunk cavities, rootstock sprouts
Prune	Leaf Hopper, Flea Beetle, Aphid, Rust & Bracket Fungus, Gummosis	Vegetation encroachment, lack of water, trunk cavities, rootstock sprouts

Table 12: Major pests, diseases and health stressors in the upper and lower orchards of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

Pests and Diseases

Figure 60: Contemporary photo showing Leafhopper damage to a European plum leaf (*NPS PWR, 2006*).

Figure 61: Contemporary photo showing bracket fungus growing on the limb of European plum (*NPS PWR, 2006*).

Figure 62: Contemporary photo showing orange-colored Gummosis exuding from European plum (*NPS PWR, 2006*).

Tree Health Stressors

Figure 63: Contemporary photo showing encroachment of woody native vegetation such as Live Oak near fruit trees (*NPS PWR, 2006*).

Figure 64: Contemporary photo showing rootstock suckers sprouting at base of pear tree (*NPS PWR, 2006*).

Figure 65: Contemporary photo of a sweet cherry tree in severe decline due to drought, loss of limbs and bark *(NPS PWR, 2006).*

PART 3:

STABILIZATION & IMPLEMENTATION PLAN

ORCHARD STABILIZATION

The definition of "stabilization" in Cultural Resources Management is derived from the principles of the *Secretary of the Interior's Standards for the Treatment of Historic Properties* (NPS, 1992*)*, whereby stabilization is identified as the interim set of actions taken before a historic preservation treatment is selected and applied. In lieu of treatment planning and the selection of a preservation, restoration, rehabilitation or reconstruction treatment, stabilization is undertaken to halt further deterioration in condition, and therefore prevent further loss of cultural resources. In an orchard, stabilization is the set of actions taken to prevent deterioration of fruit trees from good to fair condition, from fair to poor, or from poor to dead. Stabilization actions do not result in treatment, i.e., the restoration or rehabilitation of the orchard with respect to its appearance during the period of significance, but instead, they attempt to hold on to the full complement of fruit trees present until a treatment plan can be developed and applied. Stabilization conserves the fruit trees in their current or better condition, and conserves their germplasm to allow for propagation and replacement when a preservation, restoration, rehabilitation or reconstruction treatment is implemented.

Immediate Threats to the Sonoma Developmental Center Orchard

The following critical threats are found within the orchard and are compromising the health and vitality of the fruit trees. Proposed stabilization measures are intended to *immediately* remove these threats, to prevent further loss of fruit trees and landscape characteristics.

1. **Encroachment of woody vegetation:**
   Reforestation is occurring in the apple, pear, prune and lower European plum orchards. Native trees have seeded and are growing within the root zones of fruit trees, causing severe crowding and competition for light, water and nutrients.

2. **Poor orchard floor condition:**
   Dead fruit trees, woody vegetation and tall herbaceous plants are crowding the orchard floor throughout. This vegetation is competing for water and nutrients with the fruit trees, and blocking access for stabilization activities.

3. **Wood Rat ("pack rat") dens:**
   Large Wood Rat or pack rat (*Neotoma spp.*) dens exist in hollow apple and pear tree trunks. Dens cause damp, nutrient-rich conditions within the tree scaffold, leading to accelerated decay, and pack rats damage tree limbs, shoots and leaves by grazing.

4. **Drought/lack of water:**

   The fruit trees have suffered severe drought during multiple dry seasons, due to lack of irrigation or supplementary water. Orchard fruit trees require a minimum of 1" depth of water per week all year round, to remain healthy.

5. **Hollow trunks and leaning fruit trees:**

   Many fruit trees are becoming structurally unsound due to the presence of hollow trunks or limb cavities. Without structural support, death will occur when trees topple, severing the trunk from the roots.

6. **Presence of deadwood and rootstock suckers:**

   Deadwood is found in almost every fruit tree where it is inviting disease and structurally unbalancing tree scaffolds. Suckers are sprouting from the rootstock of many trees, and are competing with the scion (aerial parts of the tree) for light, water and nutrients.

STABILIZATION PLAN: SITE PROCEDURES

Encroaching Woody Vegetation Removal

PROBLEM: Reforestation by native trees has encroached upon the root zones and canopies of fruit trees, especially in the apple, pear, prune and plum orchards. The presence of encroaching trees is causing adverse impacts, including over-crowding, over-shading and competition for light, water and nutrients. Competition has led to stunted growth and limb or tree death. Additionally, encroachment by woody plants is altering the historic character of the orchard and its associated landscape characteristics. The former character-defining open spaces between rows and columns of trees have become blocked by encroaching trees, disrupting the historic spatial organization of the orchard.

STABILIZATION OBJECTIVE: Remove all encroaching woody vegetation such as Live Oak (*Quercus agrifolia*), Madrone (*Arbutus menziesii*), California Bay Laurel (*Umbellularia californica*), Coyote Brush (*Baccharis pilularis*) and Poison Oak (*Toxicodendron diversilobum*) within the boundary of the orchard areas (see the following stabilization zone maps for two options). A stable orchard should have no woody vegetation present within the orchard grid except fruit trees. Standing dead fruit trees may remain as interpretive exhibits.

Figure 66: Small-leafed European plum tree encroached upon by Coyote Brush in foreground (*NPS PWR, 2006*).

Recommended Stabilization Procedures

- Immediately remove all encroaching woody vegetation, including Coyote Brush, Live Oak, Madrone and Poison Oak etc., to prevent further light, water and nutrient competition with the fruit trees (see stabilization zones for scope of vegetation removal). The only wood vegetation remaining within the orchard should be fruit trees.

- Remove woody vegetation by flush-cutting with the ground or mowing with a brush hog. Woody vegetation should not be pulled from the ground, as this would cause soil disturbance and create the potential for erosion or disturbance to potential archeological resources. Stumps should be cut flush with the ground and orchard floor vegetation should be left no taller than 6". To prevent re-sprouting of pernicious species, paint remaining stumps with an agency-approved systemic herbicide such as *Triclopyr* or *Glyphosate*. Repeated applications may be needed to kill the roots of encroaching vegetation.

- Long-term removal of Coyote Brush cannot be achieved by one-time cutting or brush-hogging, due to its large root system. The control of Coyote Brush and other pernicious encroaching vegetation can only be accomplished through maintenance of a stable orchard floor by cyclic mowing. Mow the orchard floor at least once per month between March and September, to a maximum height of 6", to prevent re-establishment of encroaching vegetation.

- After cutting and mowing has been completed, chip and remove woody debris from the orchard to prevent spread of pests and diseases. Chips should be removed-off-site, and should not be used as mulch.

- Standing dead fruit trees may be allowed to remain as interpretive exhibits.

Orchard Floor Stabilization

PROBLEM: The orchard floor is overgrown with tall vegetation and the soil is compacted.

The orchard floor needs stabilization, to remove the excessive growth of woody and herbaceous plants around the fruit trees and relieve competition. After the orchard floor vegetation is reduced to a maximum height of 6", mulch can be spread around the fruit trees. Mulch retards evaporation, suppresses competitive vegetation growth, and increases the organic content of the soil, stimulating microbial activity and more fertile conditions.

The orchard floor has also become compacted, due to the cessation of plowing and disking activities. Soil compaction causes anaerobic conditions and tree root death. Aeration is needed to create spaces in the ground for air, water and nutrient entry. Aeration leads to fertile conditions and more root development. The most effective means of aerating the whole orchard is through the use of aeration equipment attached to a tractor.

STABILIZATION OBJECTIVE: Woody vegetation, downed dead fruit trees, tall grasses and other herbaceous plants should be removed from the orchard floor or cut back, to achieve a low ground cover no taller than 6". The orchard floor should be aerated to relieve compaction, and mulch should be spread within the root zones of living fruit trees.

Figure 67: Contemporary photo of a prune tree with overgrown orchard floor vegetation adversely affecting its health (*NPS PWR, 2006*).

Recommended Stabilization Procedures

- Remove all downed dead fruit trees from the orchard floor. Chip woody plant and fruit tree debris and remove from the orchard.

- Use a tractor-pulled brush hog and mower to establish a clean orchard flood that is no higher than 6" tall. Repeat mowing at least once a month between March and September to discourage the re-establishment of native woody plant material, grasses and Yellow Starthistle (*Centaurea solstitialis*).

- Aerate the orchard floor using tractor-pulled aeration equipment. Aerator tines should be 4 to 6" long to provide sufficient tillage. When using this type of equipment, operators should avoid hitting fruit tree roots.

- After mowing and then aerating, apply a minimum of 2" of water to each fruit tree root zone in dry conditions. Three inches of mulch should be applied to the root zone of every fruit tree. The mulch should encompass the tree with an 8'-diameter circle. Additionally, mulch should be pulled slightly away from the tree trunk and avoid contact with trunk bark, in order to prevent decay.

- A mulch of finely shredded bark mixed with chicken manure, or a nutritional mulch of mushroom or chicken compost is recommended. Coarse bark mulch should be avoided, as this draws nutrients from the soil as it decomposes. Mulching can occur at any time of the year, though should be performed immediately after mowing. Mulch is effectively applied in March, just before the trees break dormancy and leaf fall litter from the year before has decayed.

- Standing dead fruit trees may be allowed to remain as interpretive exhibits.

Wood Rat (Pack Rat) Den Removal

PROBLEM: Large Wood Rat or pack rat (*Neotoma spp.*) dens are found in hollow apple and pear tree trunks in the Sonoma Developmental Center Orchard. The presence of these dens is accelerating the deteriorating condition of the extant fruit trees.

Numerous pack rat nests are located within apple and pear trees in the upper orchard. Consisting of tightly packed woody plant debris, the dens are moderate to large in size and are found at the crown or top of the hollow trunk and in some cases in a high crotch in the canopy. Only one nest is found per tree. The dens are detrimental to the health of the trees as they inhibit airflow, retain moisture against the tree, and therefore accelerate limb or trunk decay. Pack rats also graze on the bark, shoots and leaves of fruit trees, causing die-back of the canopy.

Beyond the health problems posed to fruit trees, pack rat nests also threaten the safety of park visitors and employees. Pack rats carry Hantavirus, which can be transmitted by inhalation of aerosols infected with the virus. Aerosols are released when the nests are physically disturbed, as can occur when visitors climb or shake trees in harvesting fruit. Pack rat nests also provide a place for rattlesnakes to over-winter.

STABILIZATION OBJECTIVE: Protect apple and pear trees from continued deterioration due to pack rat nests and protect park visitors and employees from contact with pack rats dens, by removal of dens.

Figure 68: Pack rat den high in a fruit tree canopy (*NPS PWR, 2006*).

Recommended Stabilization Procedures

- Determine the number and location of pack rat dens in the orchard prior to removal, to allow for pack rat population monitoring over time.

- Dismantle pack rat dens associated with the fruit trees and remove the refuse. The dens should be carefully dismantled to avoid spreading dust particles, which may be infected with Hantavirus. When tearing down the dens, the following steps should be taken:

    - Mix equal parts of water and a general household disinfectant such as *Lysol* together. A bleach and water solution may also be used; however, the ratio of water to bleach is higher. Pour disinfectant mixture into a spray bottle. Use rubber gloves, a common face mask, heavy duty trash bags and a shovel.

    - While wearing gloves and a face mask, spray the pack rat nest with the water and disinfectant solution to settle any dust that may be associated with the rodent nest.

    - Once the den is saturated with the solution, begin shoveling the contents of the nest into a trash bag. Be careful to avoid any shiny metal objects which may be sharp. Care should also be taken to avoid contact with rattlesnakes, which may be wintering in the den.

    - As the pack rat nest is disassembled, stop and spray dry areas as they are uncovered with the disinfectant solution to avoid inhaling dust. Also, be sure to remove material from the hollow fruit tree trunk cavity. This material can be removed using metal tongs. Once clean, the hollow area should be covered with fine gauge chicken wire to prevent the construction of a new nest in the same place.

    - When the entire pack rat den has been removed and placed in trash bags, tie the trash bags, double bag them and dispose of them in the trash. The remnants of the dens can also be buried or burned.

- After the dens have been torn down, monitor the orchard and disassemble new pack rat dens if necessary. If the pack rat problem persists, consult an Integrated Pest Management (IPM) Specialist to discuss alternative methods to control the pack rat population. Alternative control methods include trapping or the use of repellants and toxicants.

- Provide information to park visitors and staff about the Hantavirus risk associated with exposure to rodents and their dens.

- Additionally, provide information to park visitors and staff about potential threats associated with rattlesnakes wintering in pack rat dens.

Figure 69: Dusky footed Wood Rat ("Pack Rat") (*courtesy of the American Society of Mammalogists*).

Irrigation Needs

PROBLEM: The fruit trees have suffered severe drought during multiple dry seasons, due to lack of irrigation or supplementary water. Orchard fruit trees require a minimum of 1" depth of water per week all year round, to remain healthy.

While no evidence of a former irrigation system is extant within the orchard, the fruit trees must have been given supplementary irrigation during dry seasons in order to become established. The fruit trees on steeper slopes are the more severely droughted, indicating the trees in lower-lying and flatter areas are tapped into a greater source of ground water draining from Mount Sonoma.

Drought conditions have caused the fruit trees to decline due to physiological stress. The trees exhibit the following characteristics, which can be attributed to lack of water over an extended period of time: wilting, leaf scorch, cracks in the bark, reduced root growth and loss of limbs, branches and leaves. Regular irrigation, while difficult to attain due to the lack of an irrigation system, is essential for the continued survival of the orchard.

STABILIZATION OBJECTIVE: To provide each fruit tree with a minimum of 1" depth of supplementary water during the dry seasons, by the least invasive means.

Recommended Stabilization Procedures

- Apply 1" depth of water per week to every fruit tree in the orchard during dry periods when there are no rain events. Generally, this applies to the June through September period.

- The following methods are suggested irrigation techniques:

    - A portable drip irrigation system using individual tree bladders such as the "TreeGator" or the "TreeRing" may be used. These small rubber bladders are installed at the base of each fruit tree and filled with a hose. Water is slowly released to the root zone of the tree as droplets through tiny perforations in the bladder. One advantage of this system is the relative speed and flexibility of installation, compared to a permanent irrigation system. Another advantage is that slow water release over a period of hours, ensuring soil penetration, rather than sheet run-off. One disadvantage is the labor intensity of filling individual bladders. More time is needed to fill individual bladders than to hand-water each tree.

- A series of drip irrigation systems can be installed in the orchard. This system can be laid on the surface of the orchard floor either along the rows or columns of fruit trees. The system is fed by an elevated reservoir, (or series of reservoirs) such as a water tank, located on high ground within the orchard. Each reservoir is filled by a tanker truck, or by pumping water from Hill (Mill) Creek. A surface drip system has the advantages of relatively quick installation, no soil disturbance and easier detection of leaks than a subterranean system. However, the drip system needs frequent monitoring and periodic flushing to prevent blockage by particulates. The system should be drained in winter to prevent freeze damage. A surface system will limit the direction of cultivation of the orchard floor. Mowing should be performed in the same direction as the orientation of the water pipes, either along the rows or columns, but not both. Over time, this will result in a strip of un-mown vegetation in the alignment of the water pipes that will need to be periodically weed-whacked.

Figure 70: Fruit tree in poor condition due to drought conditions in the Sonoma Developmental Center Orchard at Jack London State Historic Park (*NPS PWR, 2006*).

- Hand watering the orchard is an alternative method of irrigation, through the use of a portable plastic water tank. The tank, equipped with a large hose and nozzle, is transported on a truck or trailer, and is driven up and down either the rows or columns of fruit trees while hand

watering is performed through a hose. The advantage of this system is the absence of equipment installation in the orchard, and the relative flexibility in reaching isolated fruit trees. Equipment costs of the system are low, but the labor costs are high. Another disadvantage of the system is that the water is applied rapidly, rather than slowly released and some water will run-off or evaporate, rather than penetrate the soil. Excess water is applied to compensate for some run-off. Watering may be performed once a week using this system.

- The three systems described above can be used in combination. A hand watering and truck system could be used in areas easily accessible by road. A drip system could be installed in areas less accessible by vehicle, and an individual bladder system could be installed around more isolated trees or on highly drained slopes where trees would benefit from slowly released water.

Tree Propping, Bracing and Repair

PROBLEM: Many fruit trees are becoming structurally unsound due to the presence of hollow trunks or limb cavities. Without structural support, death will occur when trees topple, severing the trunk from the roots. In addition, deadwood is found in almost every fruit tree where it is inviting disease and structurally unbalancing tree scaffolds.

Trunk and limb cavities pose a significant threat to the vitality of the fruit trees. A hollow tree scaffold bears less weight than solid wood, and the hollow holds moisture, accelerating the decay of woody tissue. In addition, hollow trunks create suitable habitat for pack rat nests. Pack rats feed on living tree tissue and their nests hold moisture and microorganisms that contribute to further decomposition of the tree trunk.

The presence of deadwood in the crown of fruit trees also poses numerous threats to tree health. Deadwood gradually decays on the tree, and allows disease organisms to take hold and spread into the living parts of the tree. The presence of deadwood also impedes the natural process of healing at the "collar" or "abscission zone" of branch crotches, and therefore impedes the natural re-growth of the canopy to re-balance the weight of the tree. The presence of deadwood can physically un-balance and destabilize the tree, and is also potentially hazardous when dead limbs fall to the ground.

Fruit trees located on the steeper slopes of the orchard are leaning in the direction of prevailing winds or leaning downhill. Some trees are severely leaning, and will topple without structural support.

Many fruit trees have suckers sprouting from the rootstock, which compete with the scion (aerial parts of the tree) for light, water and nutrients. Some rootstock suckers have become so large that they are crowding out the canopy of the scion. If these suckers are not removed, they will crowd out the scion, eventually causing the scion to die. This would lead to the loss of the germplasm that bears the genes of the cultivar or variety.

STABILIZATION OBJECTIVE: All fruit trees with trunk and limb cavities are structurally unstable and should be braced to prevent them from severely leaning or falling over. Deadwood should be removed from all fruit trees to prevent disease infection and to stimulate more even re-growth of each canopy. All rootstock suckers should be removed to prevent crowding and competition with the scion (aerial parts of tree).

Recommended Stabilization Procedures

Propping/Bracing:

- Prop all fruit trees that are leaning or that have trunk or limb cavities. Tree branches 2" or smaller can be propped using a tree prop clip such as the "Fruit Brute" mounted to the top of a 2" x 4" board. Larger limbs need a brace, such as the "Cobra" strap system that holds the scaffold limbs together, or a 4" x 4" post stake or a peeled 6" diameter log stake with a short perpendicular board mounted at the top to make a "T" brace.

- Tree and limb propping/bracing should occur in late November through early March in conjunction with, but before deadwooding.

Deadwooding:

- All deadwood should be removed from fruit trees by pruning. Deadwooding should be repeated annually during the dormant season. All unstable trees should be propped or braced before deadwooding, as the act of weight-bearing during pruning could topple unstable trees.

- Deadwooding is performed using handsaws, chainsaws, pruning shears, loppers and a tree ladder. In addition, a bucket truck may be needed to reach into taller trees that are too unstable to climb. Tools should be sterilized between cuts using isopropyl alcohol. Deadwood should be flush cut immediately above the branch collar, or above the natural abscission zone. When pruning a branch ¾" in diameter or larger, cut the limb flush above the collar using the natural target method of pruning (see figure). This method of pruning leaves the branch bark ridge and branch collar intact without leaving a stub behind.

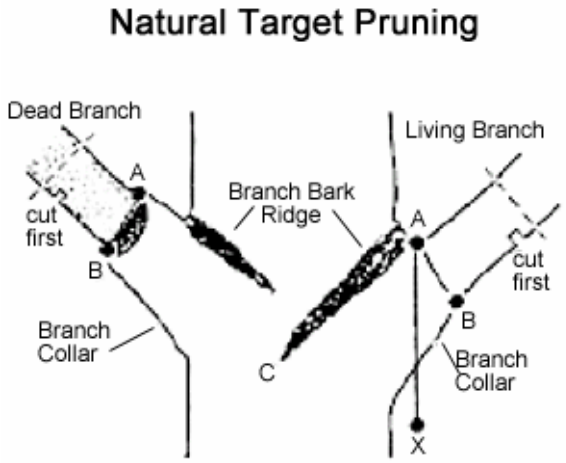

Figure 71: Drawing showing the appropriate target for pruning tree limbs, to maximize wound repair *(International Society of Arborists, 2006).*

The natural target method includes a three step process:

- The first cut is characterized by an undercut, approximately ¼ of the way through the branch. The first cut can be approximately 1 to 2" from the branch collar.

- The second cut is a downward cut just outside of the undercut. This cut is intended to remove the whole branch, taking the weight of the limb off of the tree.

- The third cut removes the remaining stub near the branch collar.

- Due to the physically unstable condition of many of the fruit trees, a chainsaw is recommended to cut deadwood limbs larger than 2" in diameter. If used carefully, the chainsaw will exert less mechanical pressure on weak trees than a traditional handsaw. Care should be taken to avoid excessive cuts with the chainsaw. The operator should step back and examine the tree between cuts. In addition, a bucket truck may be used to reach into taller trees that are too unstable to climb or reach into by ladder.

- Deadwood pruning should occur in the dormant season between late November and early March, and prior to bud swell, when leaves are absent. However, diseased wood can be removed at any time of year, as soon as it is discovered.

- After completing deadwood pruning, woody debris should be chipped and removed from the orchard to create sanitary conditions and prevent disease transmission.

- Standing dead fruit trees may be allowed to remain as interpretive exhibit

Rootstock Sucker Removal

- Suckers sprouting from the rootstock or root crown of the tree should be removed by flush-cutting with the trunk or ground. Suckers should be removed using pruning shears or loppers. Tools should be sterilized between trees using isopropyl alcohol. Some fruit tree species are more prone to rootstock suckering than others. The plum trees have more suckers than the prunes, and none were found in the apricots. Rootstock suckering can be retarded by the addition of mulch to the root zone. However, mulch should be held back from the trunk of the tree to prevent bark decay (see stabilization measure "Mulching"). Rootstock sucker debris should be chipped and removed from the orchard.

Figure 72: Contemporary photo of an apricot tree in the Sonoma Developmental Center Orchard with deadwood in its crown. Deadwoodpruning would remove the dead scaffold limb on the right side of the tree at the trunk, after bracing the tree if needed to provide structural support(*NPS PWR, 2006*).

IMPLEMENTATION PLAN

Schedule of Stabilization Activities		
Recommended Stabilization	**Description**	**Timing**
Brush Hog & Aerate	Remove downed dead trees & encroaching woody vegetation from orchard. Mow tall ground cover. Aerate orchard floor to relieve compaction.	Immediately. Repeat aerating annually.
Prop/Brace Trees/Limbs	Brace all trees with hollow trunks or limbs with stake props, arbor ties and tree prop clips.	Late November – early March immediately **before** deadwooding.
Remove Deadwood/ Rootstock suckers	Remove all deadwood from fruit trees using natural target method of pruning. Remove rootstock suckers.	Late November – early March
Brush Hog/Mow	Mow orchard floor or brush hog to achieve maximum ground cover height of 6".	Immediately. Repeat monthly between March and October, to maintain 6" maximum ground cover height.
Apply Mulch	Spread 3" depth of mulch around fruit trees in 8' diameter circle. Pull mulch away from trunk to prevent contact.	March (immediately **after** mowing)
Irrigate	Provide 1" depth of water per tree per week during dry months.	June – September
Conserve Germplasm	Take germplasm samples of each genotype (see later table) and send to NPGR with agreement	Late November to early March **after** brush hogging/mowing

Table 13: Summary of recommended stabilization activities and proposed timing in the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*.

SCOPE OF STABILIZATION: TWO OPTIONS

Stabilization is the set of actions undertaken to prevent further deterioration and loss of cultural resources, such as those found in a historic orchard. Stabilization actions are performed until a treatment plan can be developed and implemented. Stabilization ensures that cultural resources are available for future treatment. Therefore, the broadest scope of stabilization, depicted in "Option 1: Full Stabilization," is recommended. A less-than-full scope of stabilization, such as "Option 2: Partial Stabilization" may be selected due to operational constraints, but will result in a loss of cultural resources and have an impact upon the scope of future treatment. Two options for scope of stabilization are provided to respond to different management objectives.

Option 1: Full Stabilization

Full stabilization is the option that provides the broadest scope of stabilization activities. Implementation of option 1 would result in stabilization of the whole orchard. This is the recommended option. All living fruit trees would be stabilized, all orchard land areas would have a stable low ground-cover (such as grass), and the associated road system would remain stable and functional. Standing dead fruit trees may be allowed to remain as interpretive exhibits, to the extent feasible. Park visitors would have the opportunity to experience the fullest extent of the historic orchard. The scope include stabilization of the whole area of the lower orchard depicted on the boundary map (Figure 1). The scope of "option 1: full stabilization" for the upper orchard is depicted on the following maps.

Option 2: Partial Stabilization

Partial stabilization is the option that provides a reduced scope of stabilization activities. Implementation of option 2 would result in stabilization of part of the orchard, and part of the orchard would be allowed to continue to deteriorate and eventually die. (Without stabilization, the majority of tree death would occur within 5 years.) This option is not recommended, but may be selected due to operational constraints. Within each orchard area, a zone would be stabilized based on the following criteria: 1) the zone has a concentration of living fruit trees, and 2) the zone is close to a road and is therefore physically and visually accessible for stabilization activities and visitor experience. Within the zone, living trees would be stabilized, the orchard floor would be stabilized as low ground-cover and adjacent roads would remain functional. Standing dead fruit trees may be allowed to remain as interpretive exhibits, to the extent possible. Park visitors would have the opportunity to experience orchard areas closest to circulation routes (roads). The 5.5 acreas of the lower orchard may or may not be stabilized under option 2. The scope of "option 2: partial stabilization" for the upper orchard is depicted on the following maps.

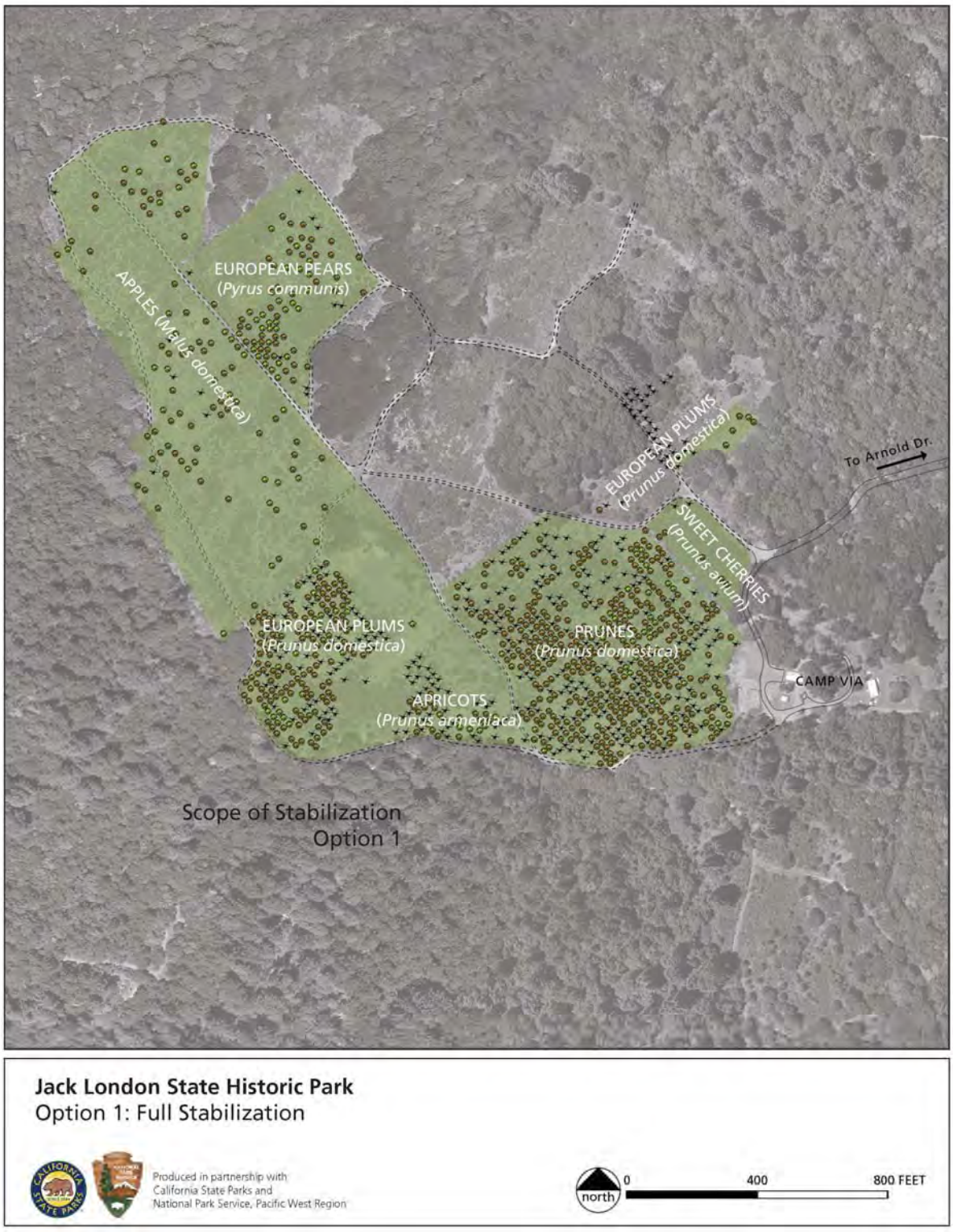

Figure 72: Site map depicting the scope of Full Stabilization of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006).*

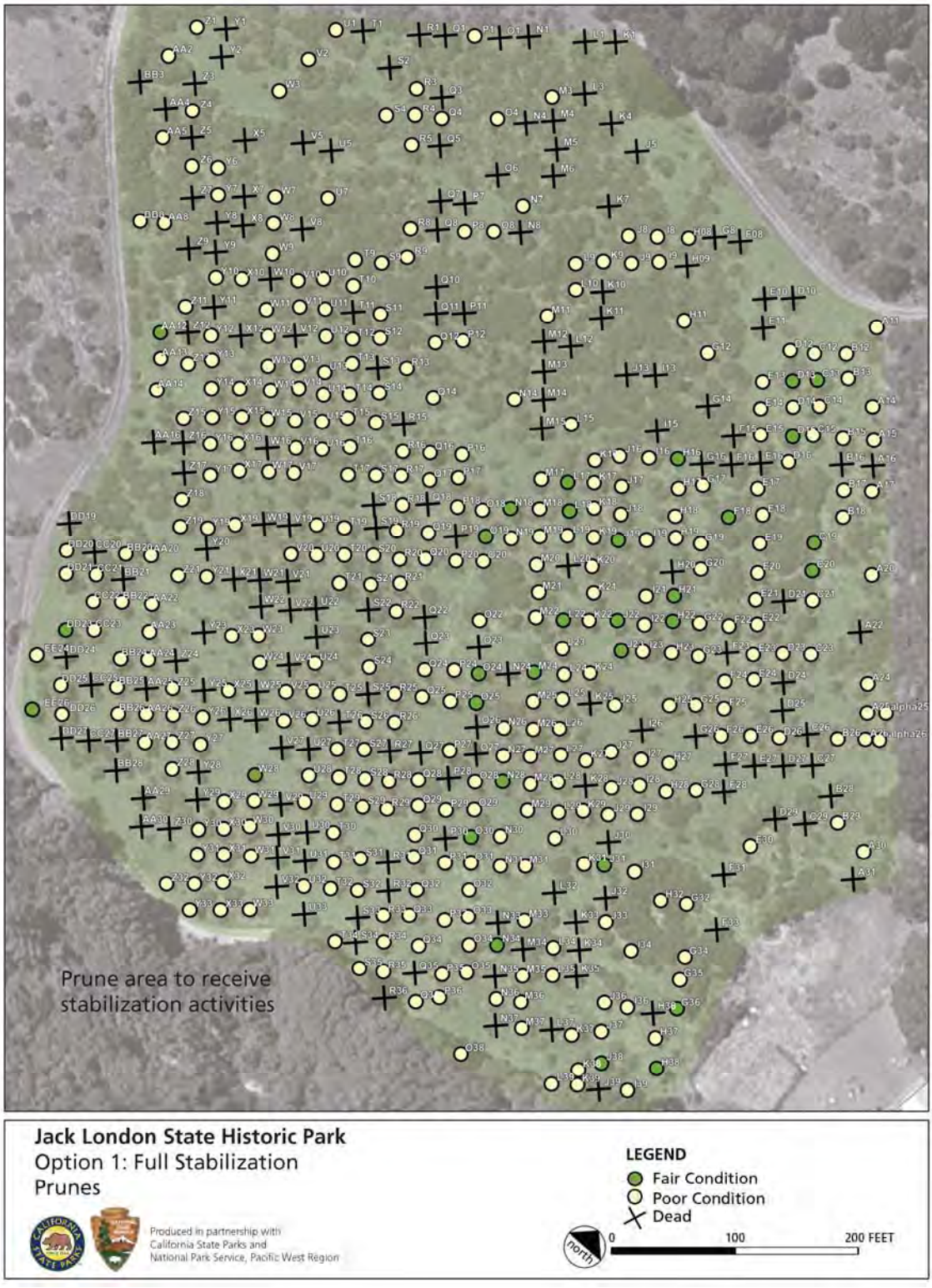

Figure 73: Site map depicting the scope of Full Stabilization of the prune species orchard at the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006).*

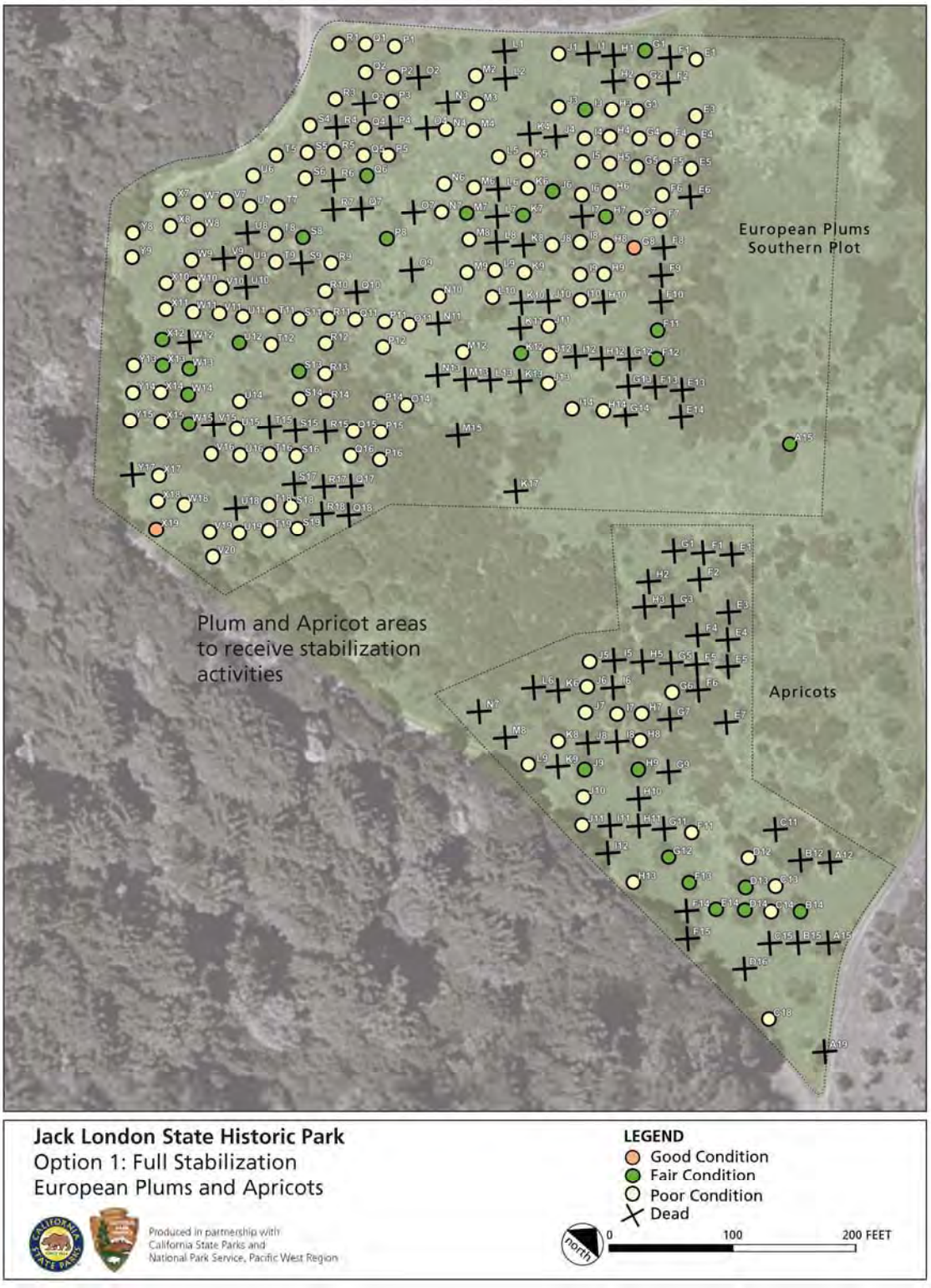

Figure 74: Site map depicting the scope of Full Stabilization of the European plum and apricot species orchards at the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006).*

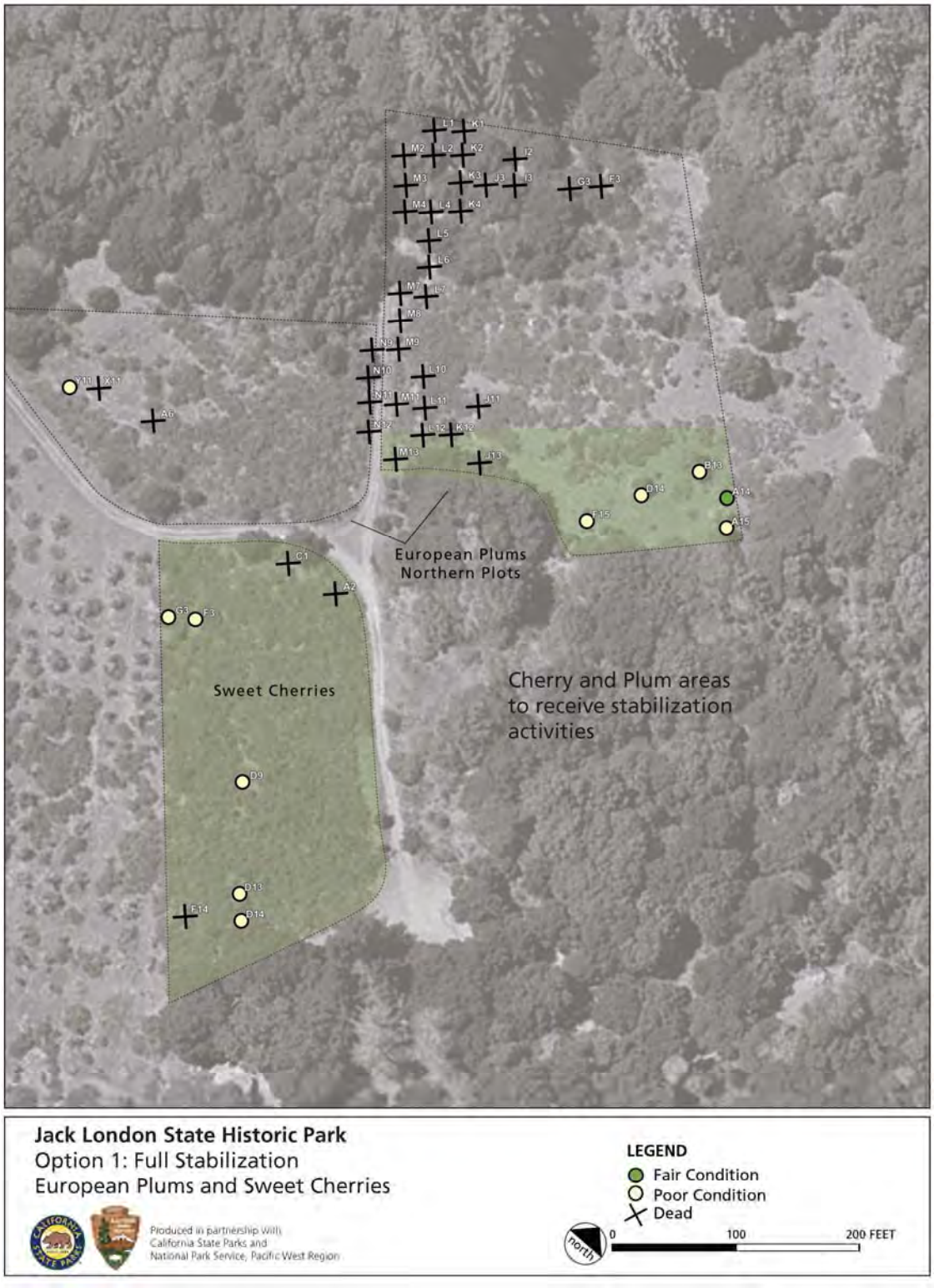

Figure 75: Site map depicting the scope of Full Stabilization of the European plum and Sweet cherry species orchard at the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006).*

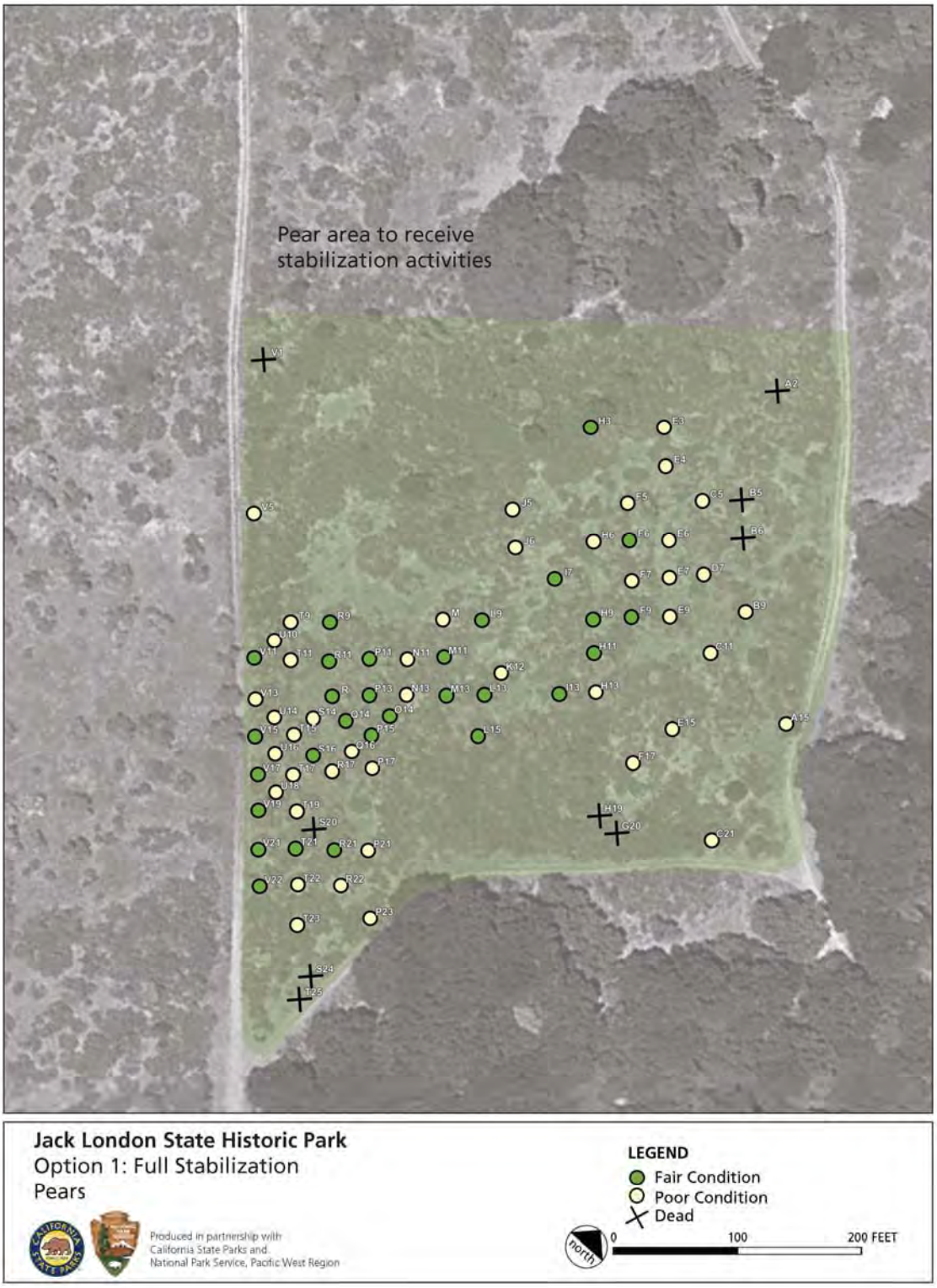

Figure 76: Site map depicting the scope of Full Stabilization of the European pear species orchard at the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006).*

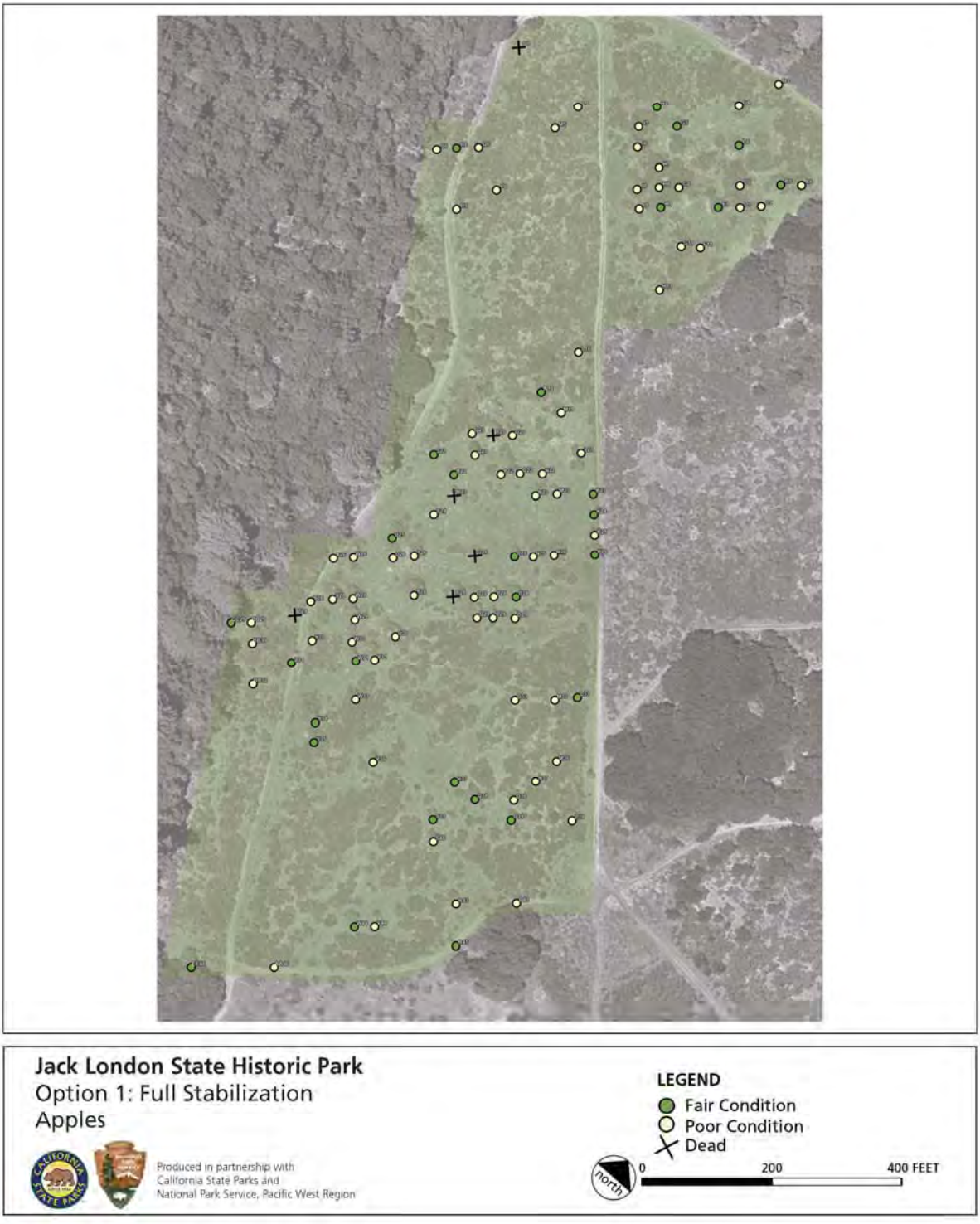

Figure 77: Site map depicting the scope of Full Stabilization of the European apple species orchard at the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006).*

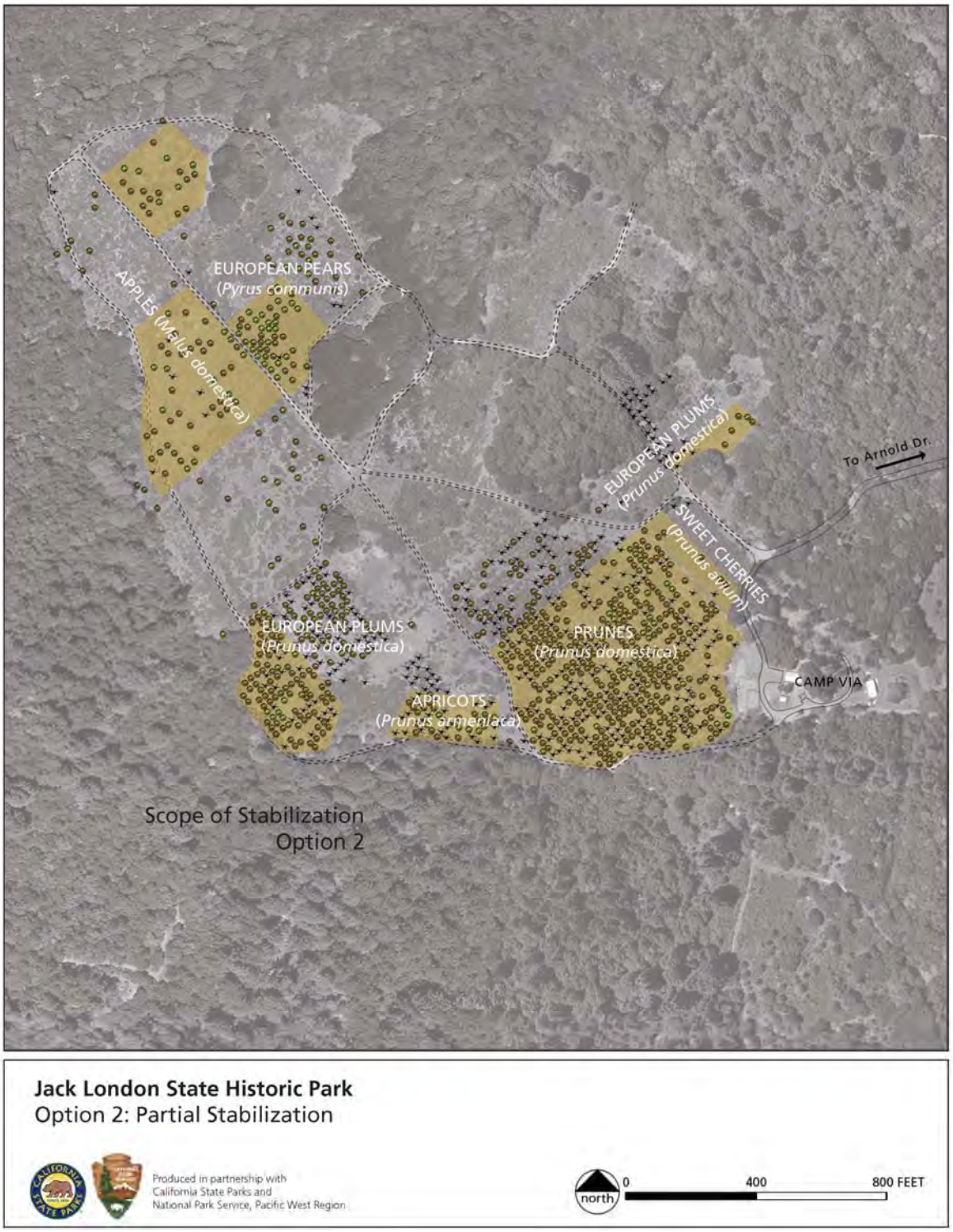

Figure 78: Site map depicting the scope of Partial Stabilization of the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006).*

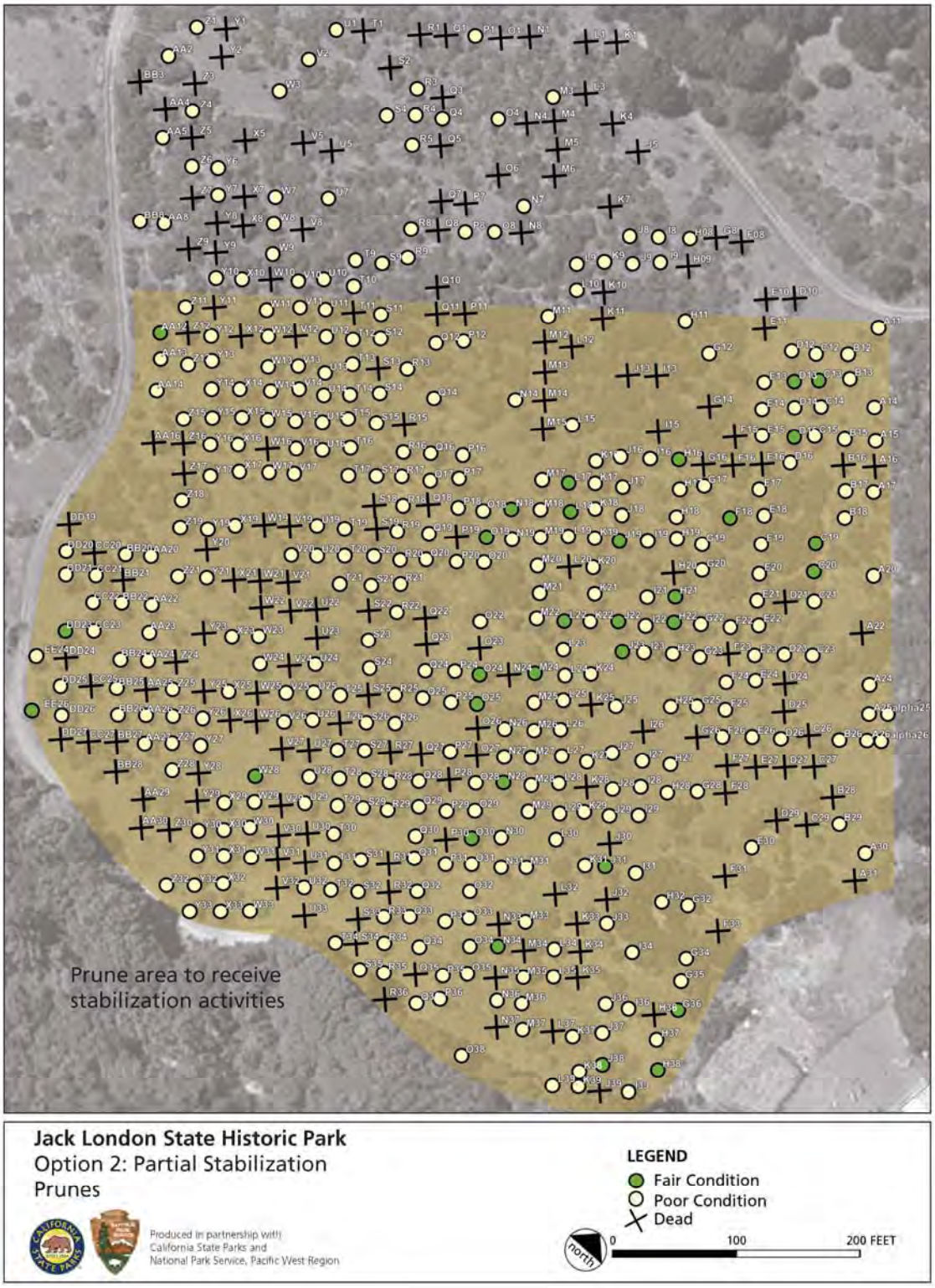

Figure 79: Site map depicting the scope of Partial Stabilization of the prune species orchard in the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006).*

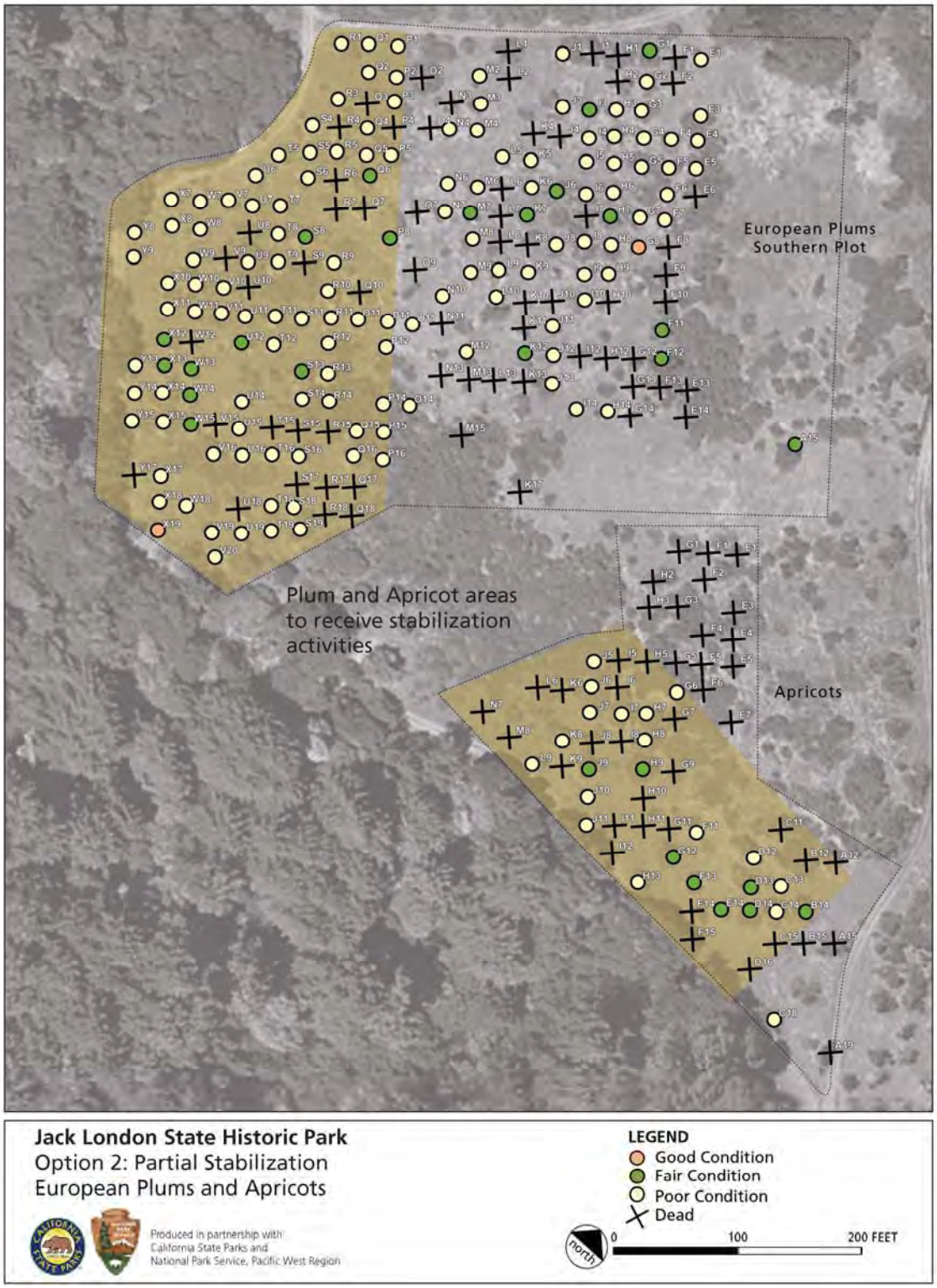

Figure 80: Site map depicting the scope of Partial Stabilization of the European plum and apricot species orchards in the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006).*

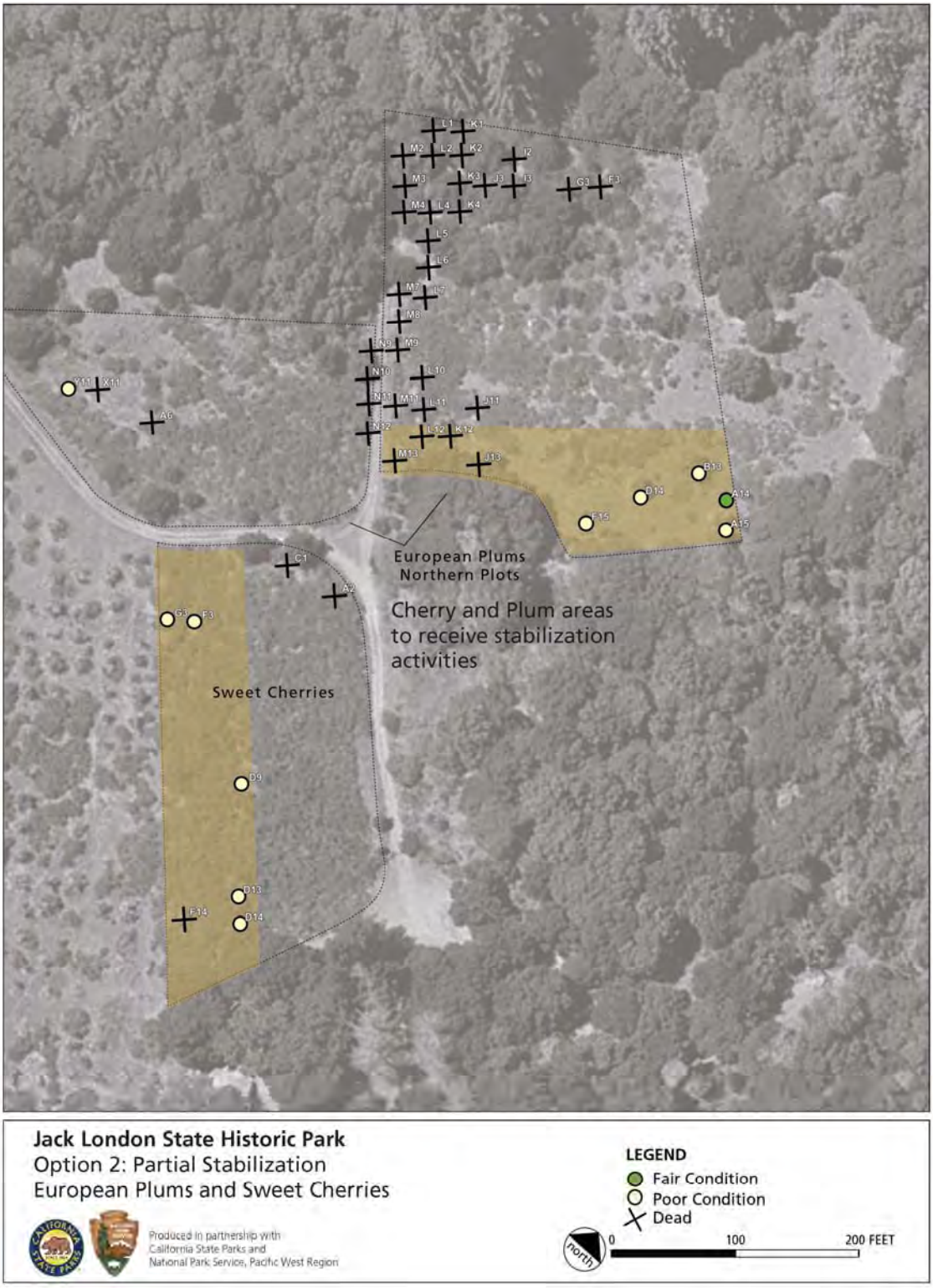

Figure 81: Site map depicting the scope of Partial Stabilization of the European plum and Sweet cherry species orchards in the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006).*

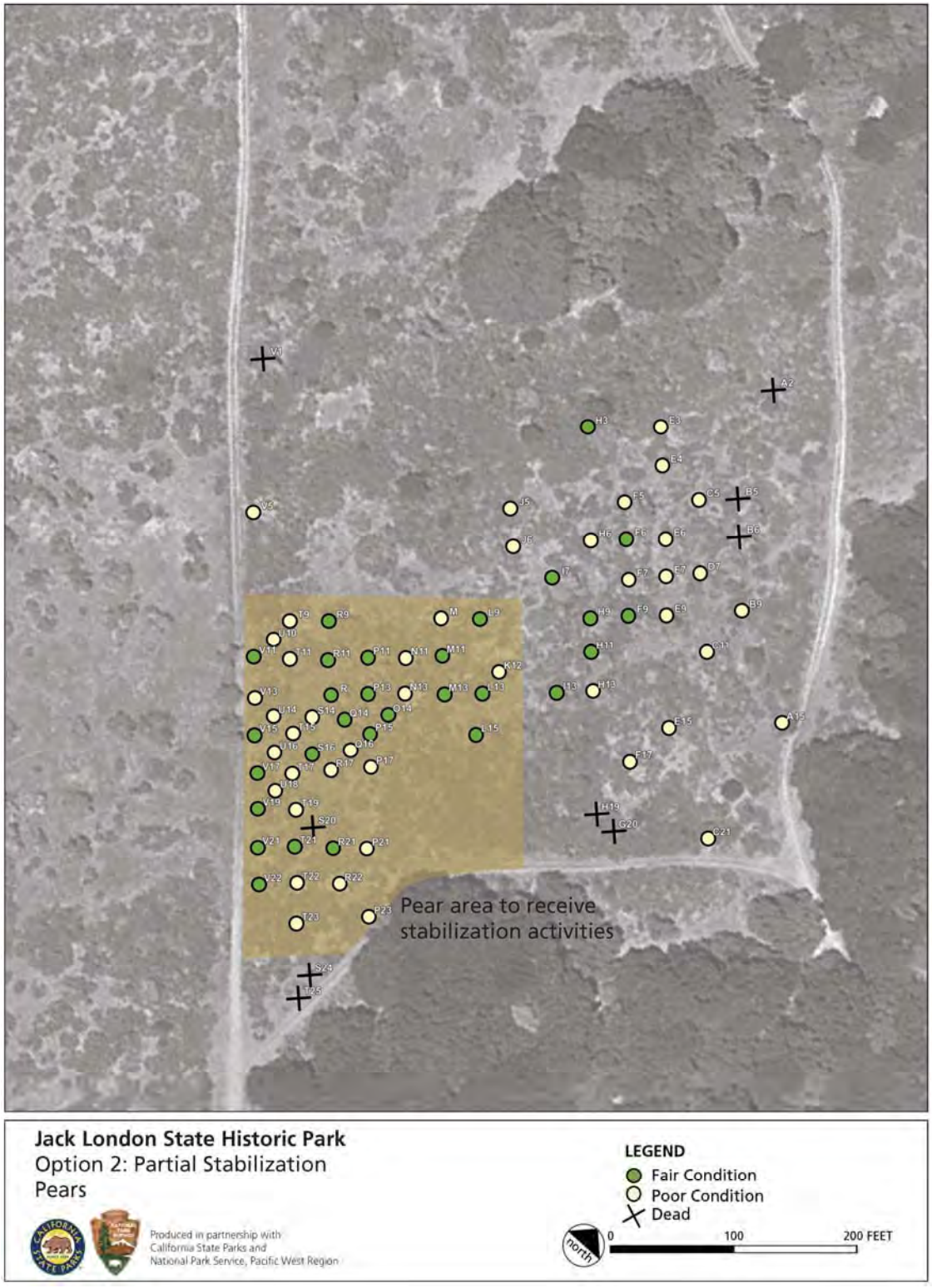

Figure 82: Site map depicting the scope of Partial Stabilization of the pear species orchard in the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*

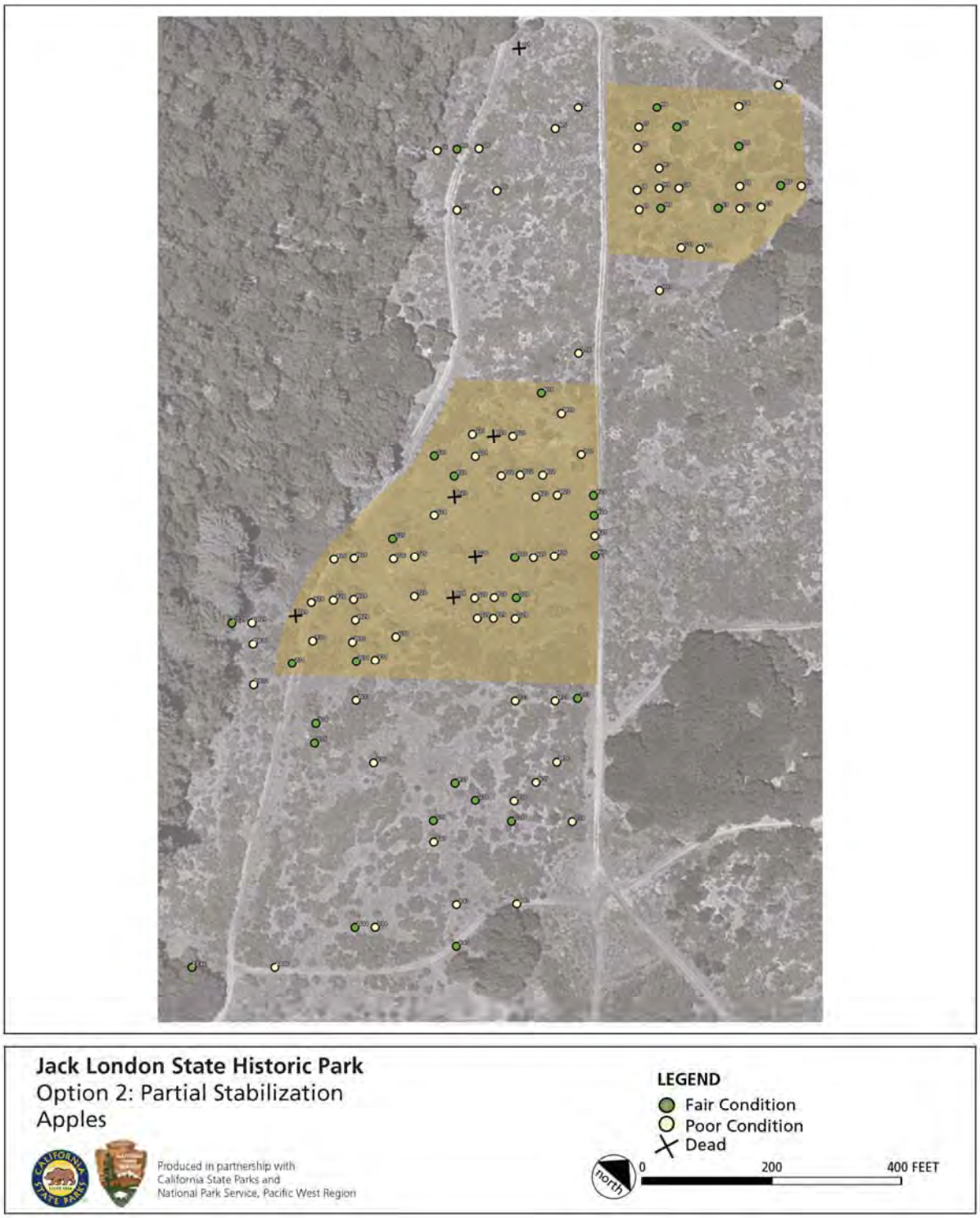

Figure 83: Site map depicting the scope of Partial Stabilization of the apple species orchard in the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006)*

SUPPLEMENTAL INFORMATION

Germplasm Conservation

Conservation of germplasm is recommended as one stabilization activity for the Sonoma Developmental Center Orchard at Jack London State Historic Park. Germplasm conservation preserves the genes of each variety and each species (full complement of genotypes) in the orchard in perpetuity. Conservation can be achieved by two means, one, through a living collection of trees representing all of the genotypes in the orchard and maintained off-site, such as in a plant nursery, and two, through cryogenic means, involving the USDA National Plant Germplasm Repositories. Cryogenically conserved germplasm is plant tissue held at sub-zero temperatures in liquid Nitrogen, where it can be thawed later and used to propagate replacement trees.

Germplasm conservation uses fruit tree cuttings from the scion. Cultivated fruit trees consist of two individuals grafted together: the scion, or aerial parts of the tree (trunk, limbs, canopy), and the rootstock, the root crown at the base of the trunk and the root system. The aerial parts of one tree and the roots of another are joined by grafting when each tree is approximately one year old. The grafted tree is then grown for one to two more years before planting in the orchard. The Sonoma Developmental Center Orchard dates from a period when fruit trees were designed to grow to a full size. These trees were grown on seedling rootstocks rather than "clonal dwarfing" rootstocks, which were used on the West Coast after 1950. Seedling rootstocks are derived from trees grown from seed. They are genetically unique individuals and have no variety. Seedling rootstocks can be identified as individuals of the "straight" species *Malus domestica*. These rootstocks confer vigor on the scion, stimulating the tree to attain a full size. Seedling rootstocks are contrasted with clonal dwarfing rootstocks that are used to dwarf contemporary fruit trees from two-thirds to one-third of the standard size.

Scions are clones of an original tree that exhibited favorable fruit characteristics. The original tree was selected and named a cultivated variety or cultivar, such as "Jonathan" or "Gravenstein" and was then propagated vegetatively to clone the genotype of the original. All scions of the same variety have the same genotype. Therefore it is not necessary to conserve the germplasm of every scion in the orchard. Germplasm conservation should focus on preserving *each variety within each species present.* Refer to the following table for known species and known varieties within the orchard. Due to the poor condition of fruit trees and lack of fruit-bearing, the variety of each fruit tree could not be positively identified. Where possible, a speculative identification for the variety is provided, based on historic period and geographic area. The orchard inventory spreadsheets and orchard existing conditions site plans (in Part I) can be used to locate each species and variety in the field. Access into the orchard and reconnaissance of individual trees for germplasm collection will be

logistically easier after encroaching woody plants have been removed from the orchard and the orchard floor vegetation reduced to a maximum height of 6".

Germplasm cuttings are taken from dormant shoots with several replicates (multiple individuals) of the same species and same variety, during the winter period. For example, germplasm for the apple variety "Jonathan" can be taken from several Jonathan trees. Each set of germplasm should be placed in a labeled, Ziploc bag with damp tissue paper, and then refrigerated until packing and express mailing to the USDA Germplasm Repository can occur. The following Germplasm Repositories should be used for these species germplasm conservation:

- **Apple Germplasm Conservation**
  Plant Genetic Resources Unit
  USDA, Agricultural Research Service
  630 West North Street
  Geneva, New York 14456
  Philip Forsline, Acting Research Leader
  (315) 787 2244

- **Pear Germplasm Conservation**
  USDA, Agricultural Research Service
  33447 SE Peoria Road
  Corvallis, Oregon 97333-2521
  Kim Hummer, Supervisory Research Horticulturist
  (541) 738 4201

- **Apricot, Plum, Prune and Cherry Germplasm Conservation**
  USDA, Agricultural Research Service
  One Shields Avenue
  Davis, California 95616
  Ed Stover, Research Leader
  (530) 752 7009

Conservation services can be provided at the USDA National Plant Germplasm Repositories through the development of an agreement between California State Parks and USDA NPGR.

Germplasm to be Collected for Conservation

ORCHARD GENOTYPES RECOMMENDED TO RECEIVE GERMPLASM CONSERVATION				
Species	**Latin Name**	**Known Varieties**	**Speculative Varieties**	**No. of Known Genotypes to be Conserved**
Apple	Malus domestica	Alexander Delicious (Hawkeye) Esopus Spitzenburg Gravenstein Jonathan Newtown Pippin Northern Spy Rhode Island Greening Winesap Yellow Bellflower Yellow Transparent		11
Apricot	Prunus armeniaca	None positively identified	Moorpark Royal Blenheim	1
European Pear	Pyrus communis	Bartlett Comice	Seckel Winter Nelis	2
European Plum	Prunus domestica	None positively identified - Lombard Group		1
Prune	Prunus domestica	Italian French		2
Sweet Cherry	Prunus avium	None positively identified	Bing Black Tartarian	1

Table 14: Known or potential varieties of each fruit species recommended for germplasm conservation in the Sonoma Developmental Center Orchard at Jack London State Historic Park *(NPS, PWR, 2006).*

Variety Identification Services

A positive identification of the variety of each tree in the Sonoma Developmental Center Orchard at Jack London State Historic Park could not be made for this document. This is due to the absence of fruit during the project period or the bearing of uncharacteristic fruit, due to the poor health of some of the fruit trees. Variety identification services can be procured through the USDA National Plant Germplasm Repositories or the California Rare Fruit Growers. Relatively new scientific developments in DNA mapping now enable the identification of fruit varieties from the DNA of leaf tissue, rather than from the macroscopic morphology of fruit. The process, called "DNA Fingerprinting" is now available for pear, apple and some stone fruits. Contact the respective Germplasm Repositories listed previously for more information about DNA Fingerprinting for variety identification. The process makes use of shoot cuttings with new leaf tissue, taken when new leaves are just emerging in spring.

The California Rare Fruit Growers may be able to provide variety identification services from fruit samples (collected and refrigerated in labeled Ziploc bags and expressed mailed to the organization). Contact CRFG at the following address:

California Rare Fruit Growers, Inc.
The Fullerton Arboretum
California State University at Fullerton (CSUF)
P.O. Box 6850
Fullerton, CA 92834-6850
http://www.crfg.org

Propagation Services

The following propagation information is provided as supplemental information for germplasm conservation and for future treatment planning. Propagation of replacement trees is not a routine stabilization activity but may become necessary if the last extant specimen of a genotype (a variety or a species) is in severe decline and cannot be stabilized. In this case, propagation to create a replacement tree may be needed to stabilize the Sonoma Developmental Center Orchard at Jack London State Historic Park.

The goal of propagation is to create new or replacement trees for the orchard, using the existing fruit trees as source material (germplasm). Vegetative propagation is a method of genetic cloning, and is therefore a way to conserve historic germplasm over time. It is desirable to conserve historic germplasm through custom-propagation efforts rather than purchase "ready-made" fruit trees from a vendor, to preserve the historic integrity of the orchard. While some of the varieties of fruit trees in the orchard are unusual but not rare, these varieties have been altered through horticultural breeding by the industry since the trees were planted. Many strains or altered versions of varieties have been created over time, to improve the commercial characteristics of the original variety. To some extent, the more common varieties such as Bartlett pear and Delicious apple have been altered most through the creation of strains. Propagation by taking cuttings from the historic trees preserves the significance and integrity of the orchard, through germplasm conservation.

When procuring propagation services, the vendor should have demonstrated expertise with historic orchard fruit varieties and access to seedling rootstocks, rather than clonal dwarfing rootstocks. When ordering, it is important to specify the following:

- The desired number of propagated trees - specify up to 30% extra to allow for some mortality after planting;
- The scion variety (scion cuttings should be provided from the Sonoma Developmental Center Orchard);
- The type of rootstock – in all cases, the type needed for the Sonoma Developmental Center Orchard will be seedling rootstock (e.g., seedling apple, seedling pear, seedling cherry, etc.., not clonal dwarfing rootstock);
- The height of the graft union – this should be specified as "low," so that when the tree is planted, the graft union will be just above the ground, depicting historic conditions;
- Desired length of cultivation – specified as one or two years. The specified delivery date should be as close as possible to the time of planting.

Propagated trees can be delivered in 6” to 1 gal-sized containers, as bareroot trees in February, or balled and burlapped (B&B). Propagated trees can be ready for delivery in one year, or may be held for two years before delivery and planting. New containerized trees to be held for two years should be potted in one gallon minimum-sized containers. After delivery, young trees should be kept well-watered until planting. The location of planting should be guided by a treatment plan.

PART IV:

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REFERENCES CITED

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PART V:

APPENDICES

APPLE CONDITION ASSESSMENT DATA

Apple (*Malus domestica*)

Tree Condition Table

October 3-6, 2006

SPECIES	TREE ID	ROW	TREE	CONDITION	CAVITY	TRUNK DIAMETER	% LIVE CANOPY	VARIETY	COMMENTS
Apple	MADO-A-8	A	8	Poor	No	28"	20%	Spitzenburg	
Apple	MADO-AA-46	AA	46	Poor	Yes	10"	40%	Winesap	
Apple	MADO-B-3	B	3	Poor	No	14"	50%	Northern Spy	
Apple	MADO-B-8	B	8	Fair	Yes	22"	35%	Spitzenburg	
Apple	MADO-BB-29	BB	29	Poor	Yes	12"	20%	Gravenstein	
Apple	MADO-BB-30	BB	30	Poor	Yes	16"	35%	Gravenstein	
Apple	MADO-BB-32	BB	32	Poor	Yes	18"	30%	Gravenstein	
Apple	MADO-C-9	C	9	Poor	Yes	20"	5%	Unidentified	No fruit
Apple	MADO-CC-29	CC	29	Fair	No	12"	40%	Unidentified	No fruit
Apple	MADO-D-4	D	4	Poor	Yes	24"	40%	Rhode Island Greening	
Apple	MADO-D-6	D	6	Fair	Yes	14"	70%	Winesap	
Apple	MADO-D-8	D	8	Poor	Yes	24"	40%	Rhode Island Greening	
Apple	MADO-D-9	D	9	Poor	Yes	24"	30%	Newtown Pippin	
Apple	MADO-E-9	E	9	Fair	Yes	24"	40%	Delicious	
Apple	MADO-EE-46	EE	46	Fair	Yes	24"	45%	Unidentified	No fruit
Apple	MADO-F-11	F	11	Poor	Yes	16"	20%	Newtown Pippin	
Apple	MADO-G-11	G	11	Poor	Yes	24"	20%	Newtown Pippin	
Apple	MADO-G-5	G	5	Fair	No	14"	35%	Delicious	
Apple	MADO-G-8	G	8	Poor	Yes	30"	45%	Delicious	
Apple	MADO-H-13	H	13	Poor	Yes	20"	1%	Unidentified	No fruit
Apple	MADO-H-4	H	4	Fair	No	12"	45%	Winesap	
Apple	MADO-H-7	H	7	Poor	Yes	22"	20%	Yellow Bellflower	
Apple	MADO-H-8	H	8	Poor	Yes	24"	40%	Spitzenburg	
Apple	MADO-H-9	H	9	Fair	No	20"	50%	Jonathan	
Apple	MADO-I-5	I	5	Poor	Yes	22"	15%	Delicious	
Apple	MADO-I-6	I	6	Poor	Yes	18"	20%	Delicious	
Apple	MADO-I-8	I	8	Poor	Yes	20"	5%	Newtown Pippin	
Apple	MADO-I-9	I	9	Poor	Yes	24"	20%	Newtown Pippin	
Apple	MADO-K-23	K	23	Fair	No	10"	45%	Winesap	
Apple	MADO-K-24	K	24	Fair	Yes	24"	50%	Gravenstein	
Apple	MADO-K-25	K	25	Poor	Yes	22"	50%	Gravenstein	
Apple	MADO-K-26	K	26	Fair	Yes	28"	60%	Gravenstein	
Apple	MADO-L-16	L	16	Poor	Yes	24"	15%	Delicious	

Apple	MADO-L-21	L	21	Poor	Yes	18"	40%	Yellow Transparent	
Apple	MADO-L-33	L	33	Fair	No	12"	60%	Northern Spy	
Apple	MADO-L-39	L	39	Poor	No	15"	20%	Northern Spy	
Apple	MADO-L-4	L	4	Poor	Yes	18"	20%	Newtown Pippin	
Apple	MADO-M-19	M	19	Poor	Yes	8"	65%	Winesap	
Apple	MADO-M-23	M	23	Poor	Yes	22"	30%	Unidentified	apple
Apple	MADO-M-26	M	26	Poor	Yes	32"	35%	Gravenstein	
Apple	MADO-M-33	M	33	Poor	No	15"	10%	Northern Spy	
Apple	MADO-M-36	M	36	Poor	No	11"	30%	Northern Spy	
Apple	MADO-M-5	M	5	Poor	Yes	24"	10%	Unidentified	No fruit
Apple	MADO-N-18	N	18	Fair	Yes	0	65%	Spitzenburg	
Apple	MADO-N-22	N	22	Poor	No	16"	40%	Newtown Pippin	
Apple	MADO-N-23	N	23	Poor	Yes	0"	5%	Alexander	
Apple	MADO-N-26	N	26	Poor	Yes	24"	30%	Gravenstein	
Apple	MADO-N-37	N	37	Poor	Yes	18"	20%	Spitzenburg	
Apple	MADO-O-1	O	1	Dead	No	0	0%	Unidentified	
Apple	MADO-O-20	O	20	Poor	Yes	19"	50%	Yellow Transparent	
Apple	MADO-O-22	O	22	Poor	Yes	30"	25%	Gravenstein	
Apple	MADO-O-26	O	26	Fair	Yes	12"	50%	Northern Spy	
Apple	MADO-O-28	O	28	Fair	No	11"	65%	Northern Spy	
Apple	MADO-O-29	O	29	Poor	Yes	18"	30%	Jonathan	
Apple	MADO-O-33	O	33	Poor	Yes	28"	30%	Unidentified	No fruit
Apple	MADO-O-38	O	38	Poor	Yes	20"	30%	Alexander	
Apple	MADO-O-39	O	39	Fair	No	8"	85%	Northern Spy	
Apple	MADO-O-43	O	43	Poor	Yes	10"	15%	Unidentified	No fruit
Apple	MADO-P-20	P	20	Dead		0	0%	Unidentified	
Apple	MADO-P-22	P	22	Poor	Yes	30"	35%	Gravenstein	
Apple	MADO-P-28	P	28	Poor	Yes	11"	25%	Winesap	
Apple	MADO-P-29	P	29	Poor	Yes	24"	25%	Alexander	
Apple	MADO-P-9	P	9	Poor	Yes	26"	15%	Unidentified	No fruit
Apple	MADO-Q-20	Q	20	Poor	Yes	13"	40%	Jonathan	
Apple	MADO-Q-21	Q	21	Poor	Yes	24"	35%	Jonathan	
Apple	MADO-Q-26	Q	26	Dead		0	0%	Unidentified	
Apple	MADO-Q-28	Q	28	Poor	Yes	24"	35%	Gravenstein	
Apple	MADO-Q-29	Q	29	Poor	Yes	30"	30%	Gravenstein	
Apple	MADO-Q-38	Q	38	Fair	No	11"	60%	Winesap	
Apple	MADO-Q-6	Q	6	Poor	Yes	32"	30	Spitzenburg	
Apple	MADO-R-22	R	22	Fair	No	13"	40	Winesap	
Apple	MADO-R-23	R	23	Dead		0	0%	Unidentified	
Apple	MADO-R-28	R	28	Dead		0	0%	Unidentified	
Apple	MADO-R-37	R	37	Fair	No	12"	30%	Yellow Transparent	
Apple	MADO-R-43	R	43	Poor	Yes	10"	30%	Winesap	

Apple	MADO-R-45	R	45	Fair	Yes	8"	30%	Yellow Transparent	
Apple	MADO-R-6	R	6	Fair	No	15"	70%	Spitzenburg	
Apple	MADO-R-9	R	9	Poor	Yes	0	50%	Spitzenburg	
Apple	MADO-S-21	S	21	Fair	No	15"	45%	Winesap	
Apple	MADO-S-24	S	24	Poor	Yes	12"	50%	Winesap	
Apple	MADO-S-39	S	39	Fair	No	10"	80%	Northern Spy	
Apple	MADO-S-40	S	40	Poor	Yes	18"	25%	Unidentified	No fruit
Apple	MADO-S-6	S	6	Poor	No	24"	30%	Unidentified	No fruit
Apple	MADO-T-26	T	26	Poor	Yes	18"	50%	Gravenstein	
Apple	MADO-T-28	T	28	Poor	Yes	24"	20%	Gravenstein	
Apple	MADO-U-25	U	25	Fair	No	14"	40%	Northern Spy	
Apple	MADO-U-26	U	26	Poor	Yes	30"	20%	Gravenstein	
Apple	MADO-U-30	U	30	Poor	Yes	28"	20%	Unidentified	No fruit
Apple	MADO-V-31	V	31	Poor	Yes	28"	30%	Gravenstein	
Apple	MADO-V-36	V	36	Poor	Yes	24"	30%	Unidentified	No fruit
Apple	MADO-V-44	V	44	Poor	Yes	18"	5%	Unidentified	No fruit
Apple	MADO-W-26	W	26	Poor	Yes	24"	50%	Gravenstein	
Apple	MADO-W-28	W	28	Poor	Yes	26"	40%	Winesap	
Apple	MADO-W-29	W	29	Poor	Yes	26"	60%	Gravenstein	
Apple	MADO-W-30	W	30	Poor	Yes	20"	30%	Gravenstein	
Apple	MADO-W-31	W	31	Fair	Yes	20"	50%	Winesap	
Apple	MADO-W-33	W	33	Poor	Yes	20"	5%	Newtown Pippin	
Apple	MADO-W-44	W	44	Fair	Yes	16"	50%	Alexander	
Apple	MADO-X-26	X	26	Poor	Yes	18"	30%	Unidentified	No fruit
Apple	MADO-X-28	X	28	Poor	Yes	26"	30%	Jonathan	
Apple	MADO-Y-28	Y	28	Poor	Yes	18"	1%	Unidentified	No fruit
Apple	MADO-Y-30	Y	30	Poor	Yes	18"	50%	Gravenstein	
Apple	MADO-Y-34	Y	34	Fair	No	18"	80%	Winesap	
Apple	MADO-Y-35	Y	35	Fair	No	12"	15%	Yellow Transparent	
Apple	MADO-Z-29	Z	29	Dead		0	0%	Unidentified	
Apple	MADO-Z-31	Z	31	Fair	No	11"	70%	Northern Spy	
Qunice	CYOB-X-19	X	19	Good	Yes	16"	80%	Unidentified	No fruit

APRICOT CONDITION ASSESSMENT DATA

Apricot (*Prunus armeniaca*)

Tree Condition Table

October 3-6, 2006

SPECIES	Tree ID	ROW	TREE	CONDITION	CAVITY	TRUNK DIAMETER	% LIVE CANOPY
Apricot	PRAR-A-12	A	12	Dead		0	0
Apricot	PRAR-A-15	A	15	Dead		20"	0
Apricot	PRAR-A-19	A	19	Dead		0	0
Apricot	PRAR-B-12	B	12	Dead		0	0
Apricot	PRAR-B-14	B	14	Fair	No	20"	35%
Apricot	PRAR-B-15	B	15	Dead		0	0
Apricot	PRAR-C-11	C	11	Dead		0	0
Apricot	PRAR-C-13	C	13	Poor	Yes	0	30%
Apricot	PRAR-C-14	C	14	Poor	Yes	0	45%
Apricot	PRAR-C-15	C	15	Dead		0	0
Apricot	PRAR-C-18	C	18	Poor	No	0	35%
Apricot	PRAR-D-12	D	12	Poor	Yes	0	40%
Apricot	PRAR-D-13	D	13	Fair	No	0	60%
Apricot	PRAR-D-14	D	14	Fair	No	20"	50%
Apricot	PRAR-D-16	D	16	Dead		0	0
Apricot	PRAR-E-1	E	1	Dead		0	0
Apricot	PRAR-E-14	E	14	Fair	No	0	50%
Apricot	PRAR-E-3	E	3	Dead		0	0
Apricot	PRAR-E-4	E	4	Dead		0	0
Apricot	PRAR-E-5	E	5	Dead		0	0
Apricot	PRAR-E-7	E	7	Dead		0	0
Apricot	PRAR-F-1	F	1	Dead	Yes	0	0
Apricot	PRAR-F-11	F	11	Poor	No	0	40%
Apricot	PRAR-F-13	F	13	Fair	Yes	0	50%
Apricot	PRAR-F-14	F	14	Dead	Yes	0	0
Apricot	PRAR-F-15	F	15	Dead	Yes	0	0
Apricot	PRAR-F-2	F	2	Dead	Yes	0	0
Apricot	PRAR-F-4	F	4	Dead	Yes	0	0
Apricot	PRAR-F-5	F	5	Dead	Yes	0	0
Apricot	PRAR-F-6	F	6	Dead	Yes	0	0
Apricot	PRAR-G-1	G	1	Dead	Yes	0	0
Apricot	PRAR-G-11	G	11	Dead	No	0	0
Apricot	PRAR-G-12	G	12	Fair	No	0	50%
Apricot	PRAR-G-3	G	3	Dead	Yes	0	0
Apricot	PRAR-G-5	G	5	Dead	Yes	0	0
Apricot	PRAR-G-6	G	6	Poor	Yes	0	30%
Apricot	PRAR-G-7	G	7	Dead	No	0	0
Apricot	PRAR-G-9	G	9	Dead	No	0	0
Apricot	PRAR-H-10	H	10	Dead	No	0	0
Apricot	PRAR-H-11	H	11	Dead	No	0	0
Apricot	PRAR-H-13	H	13	Poor	No	0	40%

Apricot	PRAR-H-2	H	2	Dead	Yes	0	0
Apricot	PRAR-H-3	H	3	Dead	Yes	0	0
Apricot	PRAR-H-5	H	5	Dead	Yes	0	0
Apricot	PRAR-H-7	H	7	Poor	Yes	0	10%
Apricot	PRAR-H-8	H	8	Poor	Yes	0	15%
Apricot	PRAR-H-9	H	9	Fair	No	0	50%
Apricot	PRAR-I-11	I	11	Dead	No	0	0
Apricot	PRAR-I-12	I	12	Dead	No	0	0
Apricot	PRAR-I-5	I	5	Dead	Yes	0	0
Apricot	PRAR-I-6	I	6	Dead	Yes	0	0
Apricot	PRAR-I-7	I	7	Poor	Yes	0	10%
Apricot	PRAR-I-8	I	8	Dead	No	0	0
Apricot	PRAR-J-10	J	10	Poor	Yes	0	35%
Apricot	PRAR-J-11	J	11	Poor	Yes	0	45%
Apricot	PRAR-J-5	J	5	Poor	Yes	0	25%
Apricot	PRAR-J-6	J	6	Poor	Yes	0	5%
Apricot	PRAR-J-7	J	7	Poor	No	0	30%
Apricot	PRAR-J-8	J	8	Dead	No	0	0
Apricot	PRAR-J-9	J	9	Fair	No	0	50%
Apricot	PRAR-K-6	K	6	Dead	Yes	0	0
Apricot	PRAR-K-8	K	8	Poor	Yes	0	25%
Apricot	PRAR-K-9	K	9	Dead	Yes	0	0
Apricot	PRAR-L-6	L	6	Dead	Yes	0	0
Apricot	PRAR-L-9	L	9	Poor	No	0	25%
Apricot	PRAR-M-8	M	8	Dead	No	0	0
Apricot	PRAR-N-7	N	7	Dead	No	0	0

SWEET CHERRY CONDITION ASSESSMENT DATA

Cherry (*Prunus avium*)

Tree Condition Table

October 3-6, 2006

SPECIES	TREE ID	ROW	TREE	CONDITION	CAVITY	TRUNK DIAMETER	% LIVE CANOPY
Sweet Cherry	PRAV-A-2	A	2	Dead		0	0
Sweet Cherry	PRAV-C-1	C	1	Dead		0	0
Sweet Cherry	PRAV-D-13	D	13	Poor	Yes	0	15%
Sweet Cherry	PRAV-D-14	D	14	Poor	Yes	32"	35%
Sweet Cherry	PRAV-D-9	D	9	Poor	Yes	0	5%
Sweet Cherry	PRAV-F-14	F	14	Dead		0	0
Sweet Cherry	PRAV-F-3	F	3	Poor	Yes	0	2%
Sweet Cherry	PRAV-G-3	G	3	Poor	Yes	0	2%
Sour Cherry	PRCE-U-9	U	9	Poor	Yes	0	80%

EUROPEAN PEAR CONDITION ASSESSMENT DATA

Pear (*Pyrus communis*)

Tree Condition Table

October 3-6, 2006

SPECIES	TREE ID	ROW	TREE	CONDITION	CAVITY	TRUNK DIAMETER	% LIVE CANOPY	VARIETY	COMMENTS
Pear	PYCO-A-15	A	15	Poor	Yes	8"	30%	Unidentified	No fruit
Pear	PYCO-A-2	A	2	Dead		12"	0	Unidentified	
Pear	PYCO-B-5	B	5	Dead	No	0	0	Unidentified	Root sprout
Pear	PYCO-B-6	B	6	Dead	No	16"	0	Bartlett	Large root sprout
Pear	PYCO-B-9	B	9	Poor	Yes	12"	50%	Bartlett	
Pear	PYCO-C-11	C	11	Poor	Yes	18"	50%	Bartlett	Tree leaning, pack rat nest
Pear	PYCO-C-21	C	21	Poor	Yes	12"	10%	Bartlett	
Pear	PYCO-C-5	C	5	Poor	Yes	12"	30%	Bartlett	
Pear	PYCO-D-7	D	7	Poor	No	6"	15%	Bartlett	
Pear	PYCO-E-15	E	15	Poor	Yes	6"	25%	Bartlett	
Pear	PYCO-E-3	E	3	Poor	Yes	14"	30%	Bartlett	
Pear	PYCO-E-4	E	4	Poor	Yes	16"	40%	Bartlett	
Pear	PYCO-E-6	E	6	Poor	No	16"	40%	Bartlett	
Pear	PYCO-E-8	E	8	Poor	No	5"	5%	Unidentified	No fruit
Pear	PYCO-E-9	E	9	Poor	Yes	8"	50%	Bartlett	Root sprout, 1/2 tree gone
Pear	PYCO-F-17	F	17	Poor	No	12"	40%	Unidentified	No fruit
Pear	PYCO-F-5	F	5	Poor	Yes	20"	40%	Bartlett	Large root sprout
Pear	PYCO-F-6	F	6	Fair	No	14"	70%	Bartlett	
Pear	PYCO-F-8	F	8	Poor	Yes	16"	40%	Bartlett	
Pear	PYCO-F-9	F	9	Fair	No	18"	70%	Bartlett	
Pear	PYCO-G-20	G	20	Dead		5"	0	Unidentified	
Pear	PYCO-H-11	H	11	Fair	No	14"	60%	Bartlett	
Pear	PYCO-H-13	H	13	Poor	No	14"	70%	Bartlett	
Pear	PYCO-H-19	H	19	Dead		8"	0	Unidentified	
Pear	PYCO-H-3	H	3	Fair	No	12"	70%	Bartlett	
Pear	PYCO-H-6	H	6	Poor	Yes	14"	50%	Bartlett	
Pear	PYCO-H-9	H	9	Fair	Yes	20"	70%	Unidentified	Root sprouts, rock in tree
Pear	PYCO-I-13	I	13	Fair	No	18"	70%	Bartlett	
Pear	PYCO-I-8	I	8	Fair	Yes	16"	70%	Bartlett	
Pear	PYCO-J-5	J	5	Poor	Yes	18"	40%	Bartlett	
Pear	PYCO-J-6	J	6		No	10"	10%	Bartlett	
Pear	PYCO-K-12	K	12	Poor	No	8"	50%	Bartlett	
Pear	PYCO-L-13	L	13	Fair	Yes	14"	60%	Bartlett	
Pear	PYCO-L-15	L	15	Fair	Yes	16"	70%	Bartlett	
Pear	PYCO-L-9	L	9	Fair	Yes	18"	65%	Bartlett	Pack rat nest
Pear	PYCO-M-	M		Poor	No	16"	35%	Bartlett	
Pear	PYCO-M-11	M	11	Fair	Yes	14"	50%	Bartlett	Pack rat nest in cavity
Pear	PYCO-M-13	M	13	Fair	No	14"	75%	Bartlett	

Pear	PYCO-N-11	N	11	Poor	Yes	16"	25%	Bartlett	Pack rat nest
Pear	PYCO-N-13	N	13	Poor	Yes	18"	60%	Bartlett	
Pear	PYCO-O-14	O	14	Fair	No	6"	40%	Bartlett	
Pear	PYCO-P-11	P	11	Fair	No	20"	75%	Bartlett	Fruit is squat shaped
Pear	PYCO-P-13	P	13	Fair	No	18"	80%	Bartlett	
Pear	PYCO-P-15	P	15	Fair	No	12"	50%	Bartlett	
Pear	PYCO-P-17	P	17	Poor	Yes	10"	60%	Bartlett	
Pear	PYCO-P-21	P	21	Poor	Yes	8"	40%	Small Comice	
Pear	PYCO-P-23	P	23	Poor	No	10"	40%	Unidentified	No fruit
Pear	PYCO-Q-14	Q	14	Fair	No	8"	65%	Bartlett	Fruit is squat shaped
Pear	PYCO-Q-16	Q	16	Poor	No	8"	15%	Bartlett	Fruit is squat shaped
Pear	PYCO-R-	R		Fair	Yes	16"	60%	Bartlett	
Pear	PYCO-R-11	R	11	Fair	No	12"	70%	Bartlett	
Pear	PYCO-R-17	R	17	Poor	Yes	9"	5%	Bartlett	
Pear	PYCO-R-21	R	21	Fair	No	16"	60%	Comice	
Pear	PYCO-R-22	R	22	Poor	No	16"	2%	Unidentified	Topped, nearly dead
Pear	PYCO-R-9	R	9	Fair	No	14"	75%	Bartlett	
Pear	PYCO-S-14	S	14	Poor	No	6"	40%	Bartlett	
Pear	PYCO-S-16	S	16	Fair	No	8"	55%	Bartlett	
Pear	PYCO-S-20	S	20	Dead	No	0	0	Unidentified	
Pear	PYCO-S-24	S	24	Dead	No	5"	0	Unidentified	
Pear	PYCO-T-11	T	11	Poor	Yes	10"	50%	Bartlett	Pack rat nest in cavity
Pear	PYCO-T-15	T	15	Poor	Yes	18"	30%	Bartlett	Sucker
Pear	PYCO-T-17	T	17	Poor	Yes	10"	25%	Bartlett	
Pear	PYCO-T-19	T	19	Poor	Yes	12"	0	Bartlett	Trunk damage
Pear	PYCO-T-21	T	21	Fair	No	16"	65%	Comice	
Pear	PYCO-T-22	T	22	Poor	No	12"	40%	Comice	
Pear	PYCO-T-23	T	23	Poor	Yes	10"	5%	Bartlett	
Pear	PYCO-T-25	T	25	Dead	No	10"	0	Unidentified	
Pear	PYCO-T-9	T	9	Poor	No	10"	5%	Bartlett	
Pear	PYCO-U-10	U	10	Poor	No	6"	10%	Bartlett	
Pear	PYCO-U-14	U	14	Poor	No	5"	0	Bartlett	
Pear	PYCO-U-16	U	16	Poor	No	6"	45%	Bartlett	Fruit is squat shaped
Pear	PYCO-U-18	U	18	Poor	No	5"	5%	Bartlett	Live Oak enroachment
Pear	PYCO-V-1	V	1	Dead		0"	0	Unidentified	
Pear	PYCO-V-11	V	11	Fair	No	12"	75%	Bartlett	
Pear	PYCO-V-13	V	13	Poor	No	10"	40%	Bartlett	
Pear	PYCO-V-15	V	15	Fair	No	12"	60%	Bartlett	Rootstock sprout
Pear	PYCO-V-17	V	17	Fair	No	10"	70%	Bartlett	
Pear	PYCO-V-19	V	19	Fair	No	12"	50%	Bartlett	
Pear	PYCO-V-21	V	21	Fair	No	14"	50%	Comice	
Pear	PYCO-V-22	V	22	Fair	No	16"	75%	Comice	
Pear	PYCO-V-5	V	5	Poor	No	14"	15%	Comice	

EUROPEAN PLUM (UPPER ORCHARD) CONDITION ASSESSMENT DATA

Large-Leaved European Plum (*Prunus domestica*)

Tree Condition Table

October 3-6, 2006

SPECIES	TREE ID	ROW	TREE	CONDITION	CAVITY	TRUNK DIAMETER	% LIVE CANOPY	TYPE	COMMENTS
Plum	PRDO2-A-15-N	A	15	Poor	Yes	0	10%	European	Purple leaves (seedling)
Plum	PRDO2-A-15-S	A	15	Fair	Yes	0	75%	European	
Plum	PRDO2-D-14-N	D	14	Poor	Yes	14"	20%	European	
Plum	PRDO2-E-13-S	E	13	Dead		0	0	European	
Plum	PRDO2-E-14-S	E	14	Dead		0	0	European	
Plum	PRDO2-E-1-S	E	1	Poor	Yes	0	30%	European	
Plum	PRDO2-E-3-S	E	3	Poor	Yes	0	40%	European	
Plum	PRDO2-E-4-S	E	4	Poor	Yes	15"	35%	European	
Plum	PRDO2-E-5-S	E	5	Poor	Yes	0	10%	European	
Plum	PRDO2-E-6-S	E	6	Dead		0	0	European	
Plum	PRDO2-F-10-S	F	10	Dead	No	0	0	European	
Plum	PRDO2-F-11-S	F	11	Fair	No	0	40%	European	Root sprout
Plum	PRDO2-F-13-S	F	13	Dead	No	0	0	European	
Plum	PRDO2-F-15-N	F	15	Poor	Yes	0	5%	European	
Plum	PRDO2-F-1-S	F	1	Dead	Yes	0	0	European	
Plum	PRDO2-F-2-S	F	2	Dead	Yes	0	0	European	
Plum	PRDO2-F-3-N	F	3	Dead		0	0	European	
Plum	PRDO2-F-4-S	F	4	Poor	Yes	0	25%	European	
Plum	PRDO2-F-5-S	F	5	Poor	Yes	0	15%	European	
Plum	PRDO2-F-6-S	F	6	Poor	No	0	15%	European	
Plum	PRDO2-F-7-S	F	7	Poor	No	0	20%	European	
Plum	PRDO2-F-8-S	F	8	Dead	No	0	0	European	
Plum	PRDO2-F-9-S	F	9	Dead	No	0	0	European	Root sprout
Plum	PRDO2-G-12-S	G	12	Dead		0	0	European	
Plum	PRDO2-G-13-S	G	13	Dead		0	0	European	
Plum	PRDO2-G-14-S	G	14	Dead		0	0	European	
Plum	PRDO2-G-1-S	G	1	Fair	No	0	45%	European	
Plum	PRDO2-G-2-S	G	2	Poor	Yes	0	20%	European	
Plum	PRDO2-G-3-N	G	3	Dead		0	0	European	
Plum	PRDO2-G-3-S	G	3	Poor	No	0	25%	European	
Plum	PRDO2-G-4-S	G	4	Poor	No	15"	35%	European	
Plum	PRDO2-G-5-S	G	5	Poor	Yes	0	50%	European	
Plum	PRDO2-G-7-S	G	7	Poor	Yes	0	35%	European	
Plum	PRDO2-G-8-S	G	8	Good	No	0	20%	European	
Plum	PRDO2-H-10-S	H	10	Dead	Yes	0	0	European	
Plum	PRDO2-H-12-S	H	12	Dead	Yes	0	0	European	
Plum	PRDO2-H-14-S	H	14	Poor	Yes	0	10%	European	
Plum	PRDO2-H-1-S	H	1	Dead	Yes	0	0	European	
Plum	PRDO2-H-2-S	H	2	Dead	Yes	0	0	European	
Plum	PRDO2-H-3-S	H	3	Poor	Yes	0	35%	European	

Plum	PRDO2-H-4-S	H	4	Poor	Yes	0	35%	European	
Plum	PRDO2-H-5-S	H	5	Poor	Yes	0	10%	European	
Plum	PRDO2-H-6-S	H	6	Poor	Yes	0	35%	European	
Plum	PRDO2-H-7-S	H	7	Fair	Yes	0	40%	European	
Plum	PRDO2-H-8-S	H	8	Poor	Yes	0	25%	European	
Plum	PRDO2-H-9-S	H	9	Poor	Yes	0	30%	European	
Plum	PRDO2-I-10-S	I	10	Poor	No	0	40%	European	
Plum	PRDO2-I-12-S	I	12	Dead		0	0	European	
Plum	PRDO2-I-14-S	I	14	Poor	Yes	0	20%	European	
Plum	PRDO2-I-1-S	I	1	Dead		0	0	European	
Plum	PRDO2-I-2-N	I	2	Dead		0	0	European	
Plum	PRDO2-I-3-N	I	3	Dead		0	0	European	
Plum	PRDO2-I-3-S	I	3	Fair	Yes	0	60%	European	
Plum	PRDO2-I-4-S	I	4	Poor	Yes	0	10%	European	
Plum	PRDO2-I-5-S	I	5	Poor	Yes	0	10%	European	
Plum	PRDO2-I-6-S	I	6	Poor	Yes	0	15%	European	
Plum	PRDO2-I-7-S	I	7	Dead		0	0	European	
Plum	PRDO2-I-9-S	I	9	Poor	Yes	0	10%	European	
Plum	PRDO2-J-10-S	J	10	Dead	Yes	0	0	European	
Plum	PRDO2-J-11-N	J	11	Dead		0	0	European	
Plum	PRDO2-J-11-S	J	11	Poor	Yes	0	40%	European	
Plum	PRDO2-J-12-S	J	12	Poor	Yes	0	10%	European	
Plum	PRDO2-J-13-N	J	13	Dead		0	0	European	
Plum	PRDO2-J-13-S	J	13	Poor	Yes	0	30%	European	
Plum	PRDO2-J-1-S	J	1	Poor	Yes	0	5%	European	
Plum	PRDO2-J-3-N	J	3	Dead		0	0	European	
Plum	PRDO2-J-3-S	J	3	Poor	Yes	0	20%	European	
Plum	PRDO2-J-4-S	J	4	Dead	No	0	0	European	
Plum	PRDO2-J-6-S	J	6	Fair	No	0	35%	European	
Plum	PRDO2-J-8-S	J	8	Poor	Yes	0	10%	European	
Plum	PRDO2-K-10-S	K	10	Dead		0	0	European	
Plum	PRDO2-K-11-S	K	11	Dead		0	0	European	
Plum	PRDO2-K-12-N	K	12	Dead		0	0	European	
Plum	PRDO2-K-12-S	K	12	Fair	No	0	40%	European	
Plum	PRDO2-K-13-S	K	13	Dead		0	0	European	
Plum	PRDO2-K-17-S	K	17	Dead	No	0	0	European	Root sprout
Plum	PRDO2-K-1-N	K	1	Dead		0	0	European	
Plum	PRDO2-K-2-N	K	2	Dead		0	0	European	
Plum	PRDO2-K-3-N	K	3	Dead		0	0	European	
Plum	PRDO2-K-4-N	K	4	Dead		0	0	European	
Plum	PRDO2-K-4-S	K	4	Dead		0	0	European	
Plum	PRDO2-K-5-S	K	5	Poor	No	0	25%	European	
Plum	PRDO2-K-6-S	K	6	Poor	Yes	0	30%	European	
Plum	PRDO2-K-7-S	K	7	Fair	No	0	40%	European	
Plum	PRDO2-K-8-S	K	8	Dead		0	0	European	
Plum	PRDO2-K-9-S	K	9	Poor	No	0	20%	European	
Plum	PRDO2-L-10-N	L	10	Dead		24"	0	European	
Plum	PRDO2-L-10-S	L	10	Poor	Yes	0	10%	European	1/2 Damson
Plum	PRDO2-L-11-N	L	11	Dead		24"	0	European	

Plum	PRDO2-L-12-N	L	12	Dead		10"	0	European	
Plum	PRDO2-L-13-S	L	13	Dead	No	0	0	European	
Plum	PRDO2-L-1-N	L	1	Dead		0	0	European	
Plum	PRDO2-L-1-S	L	1	Dead	Yes	0	0	European	
Plum	PRDO2-L-2-N	L	2	Dead		0	0	European	
Plum	PRDO2-L-2-S	L	2	Dead	Yes	0	0	European	
Plum	PRDO2-L-4-N	L	4	Dead		0	0	European	
Plum	PRDO2-L-5-N	L	5	Dead		0	0	European	
Plum	PRDO2-L-5-S	L	5	Poor	Yes	0	30%	European	
Plum	PRDO2-L-6-N	L	6	Dead		0	0	European	
Plum	PRDO2-L-6-S	L	6	Dead	Yes	0	0	European	
Plum	PRDO2-L-7-N	L	7	Dead		0	0	European	
Plum	PRDO2-L-7-S	L	7	Dead	Yes	0	0	European	
Plum	PRDO2-L-8-S	L	8	Dead	Yes	0	0	European	
Plum	PRDO2-M-11-N	M	11	Dead		0	0	European	
Plum	PRDO2-M-12-S	M	12	Poor	Yes	0	40%	European	
Plum	PRDO2-M-13-N	M	13	Dead		0	0	European	
Plum	PRDO2-M-13-S	M	13	Dead		0	0	European	
Plum	PRDO2-M-15-S	M	15	Dead		0	0	European	
Plum	PRDO2-M-2-N	M	2	Dead		0	0	European	
Plum	PRDO2-M-2-S	M	2	Poor	Yes	0	5%	European	
Plum	PRDO2-M-3-N	M	3	Dead		0	0	European	
Plum	PRDO2-M-3-S	M	3	Poor	Yes	0	30%	European	
Plum	PRDO2-M-4-N	M	4	Dead		0	0	European	
Plum	PRDO2-M-4-S	M	4	Poor	Yes	0	30%	European	
Plum	PRDO2-M-6-S	M	6	Poor	No	0	25%	European	
Plum	PRDO2-M-7-N	M	7	Dead		0	0	European	
Plum	PRDO2-M-7-S	M	7	Fair	Yes	17"	50%	European	
Plum	PRDO2-M-8-N	M	8	Dead		0	0	European	
Plum	PRDO2-M-8-S	M	8	Poor	Yes	0	30%	European	
Plum	PRDO2-M-9-N	M	9	Dead		0	0	European	
Plum	PRDO2-M-9-S	M	9	Poor	Yes	0	25%	European	
Plum	PRDO2-N-10-N	N	10	Dead		0	0	European	Purple leaves (seedling)
Plum	PRDO2-N-10-S	N	10	Poor	Yes	0	5%	European	
Plum	PRDO2-N-11-N	N	11	Dead		0	0	European	
Plum	PRDO2-N-11-S	N	11	Dead	No	0	0	European	
Plum	PRDO2-N-12-N	N	12	Dead		0	0	European	
Plum	PRDO2-N-13-S	N	13	Dead	No	0	0	European	
Plum	PRDO2-N-3-S	N	3	Dead	Yes	0	0	European	
Plum	PRDO2-N-4-S	N	4	Poor	Yes	0	30%	European	
Plum	PRDO2-N-6-S	N	6	Poor	Yes	0	10%	European	
Plum	PRDO2-N-7-S	N	7	Poor	Yes	0	20%	European	
Plum	PRDO2-N-9-N	N	9	Dead		0	0	European	
Plum	PRDO2-O-11-S	O	11	Poor	Yes	0	40%	European	
Plum	PRDO2-O-14-S	O	14	Poor	Yes	0	5%	European	
Plum	PRDO2-O-2-S	O	2	Dead		0	0	European	
Plum	PRDO2-O-4-S	O	4	Dead		0	0	European	
Plum	PRDO2-O-7-S	O	7	Dead		0	0	European	
Plum	PRDO2-O-9-S	O	9	Dead		0	0	European	
Plum	PRDO2-P-11-S	P	11	Poor	Yes	0	10%	European	

Plum	PRDO2-P-12-S	P	12	Poor	Yes	0	35%	European	
Plum	PRDO2-P-14-S	P	14	Poor	No	0	45%	European	
Plum	PRDO2-P-15-S	P	15	Poor	No	0	25%	European	
Plum	PRDO2-P-16-S	P	16	Poor	Yes	0	5%	European	
Plum	PRDO2-P-1-S	P	1	Poor	Yes	0	5%	European	
Plum	PRDO2-P-2-S	P	2	Poor	Yes	0	20%	European	
Plum	PRDO2-P-3-S	P	3	Poor	Yes	0	10%	European	
Plum	PRDO2-P-4-S	P	4	Dead	Yes	0	0	European	
Plum	PRDO2-P-5-S	P	5	Poor	Yes	0	25%	European	
Plum	PRDO2-P-8-S	P	8	Fair	No	0	40%	European	
Plum	PRDO2-Q-10-S	Q	10	Dead		0	0	European	
Plum	PRDO2-Q-11-S	Q	11	Poor	Yes	0	35%	European	
Plum	PRDO2-Q-15-S	Q	15	Poor	Yes	0	50%	European	
Plum	PRDO2-Q-16-S	Q	16	Poor	No	0	50%	European	
Plum	PRDO2-Q-17-S	Q	17	Dead		0	0	European	
Plum	PRDO2-Q-18-S	Q	18	Dead		0	0	European	
Plum	PRDO2-Q-1-S	Q	1	Poor	No	0	40%	European	
Plum	PRDO2-Q-2-S	Q	2	Poor	Yes	0	20%	European	
Plum	PRDO2-Q-3-S	Q	3	Dead		0	0	European	
Plum	PRDO2-Q-4-S	Q	4	Poor	Yes	0	20%	European	
Plum	PRDO2-Q-5-S	Q	5	Poor	Yes	0	30%	European	
Plum	PRDO2-Q-6-S	Q	6	Fair	No	0	50%	European	
Plum	PRDO2-Q-7-S	Q	7	Dead		0	0	European	
Plum	PRDO2-R-10-S	R	10	Poor	Yes	0	30%	European	
Plum	PRDO2-R-11-S	R	11	Poor	Yes	0	20%	European	
Plum	PRDO2-R-12-S	R	12	Poor	Yes	0	40%	European	Root sprout
Plum	PRDO2-R-13-S	R	13	Poor	Yes	0	40%	European	Root sprout
Plum	PRDO2-R-14-S	R	14	Poor	Yes	0	25%	European	
Plum	PRDO2-R-15-S	R	15	Dead	Yes	0	0	European	
Plum	PRDO2-R-17-S	R	17	Dead	Yes	0	0	European	
Plum	PRDO2-R-18-S	R	18	Dead	Yes	0	0	European	
Plum	PRDO2-R-1-S	R	1	Poor	Yes	0	25%	European	
Plum	PRDO2-R-3-S	R	3	Poor	Yes	0	15%	European	Madrona near tree
Plum	PRDO2-R-4-S	R	4	Dead	Yes	0	0	European	Root sprout
Plum	PRDO2-R-5-S	R	5	Poor	Yes	0	30%	European	
Plum	PRDO2-R-6-S	R	6	Dead	Yes	0	0	European	
Plum	PRDO2-R-7-S	R	7	Dead	Yes	0	0	European	
Plum	PRDO2-R-9-S	R	9	Poor	Yes	0	15%	European	
Plum	PRDO2-S-11-S	S	11	Poor	Yes	0	20%	European	
Plum	PRDO2-S-13-S	S	13	Fair	No	15"	65%	European	
Plum	PRDO2-S-14-S	S	14	Poor	Yes	0	40%	European	
Plum	PRDO2-S-15-S	S	15	Dead	Yes	0	0	European	
Plum	PRDO2-S-16-S	S	16	Poor	Yes	0	25%	European	
Plum	PRDO2-S-17-S	S	17	Dead	No	0	0	European	
Plum	PRDO2-S-18-S	S	18	Poor	No	0	5%	European	
Plum	PRDO2-S-19-S	S	19	Poor	No	0	2%	European	
Plum	PRDO2-S-4-S	S	4	Poor	Yes	0	10%	European	
Plum	PRDO2-S-5-S	S	5	Poor	Yes	0	1%	European	
Plum	PRDO2-S-6-S	S	6	Poor	No	0	15%	European	
Plum	PRDO2-S-8-S	S	8	Fair	Yes	0	40%	European	

Plum	PRDO2-S-9-S	S	9	Dead		0	0	European	
Plum	PRDO2-T-11-S	T	11	Poor	No	0	5%	European	
Plum	PRDO2-T-12-S	T	12	Poor	Yes	0	40%	European	
Plum	PRDO2-T-15-S	T	15	Dead	Yes	0	0	European	
Plum	PRDO2-T-16-S	T	16	Poor	Yes	0	5%	European	
Plum	PRDO2-T-18-S	T	18	Poor	No	0	25%	European	
Plum	PRDO2-T-19-S	T	19	Poor	Yes	0	1%	European	
Plum	PRDO2-T-5-S	T	5	Poor	Yes	0	5%	European	
Plum	PRDO2-T-7-S	T	7	Poor	Yes	0	5%	European	
Plum	PRDO2-T-8-S	T	8	Poor	Yes	0	10%	European	
Plum	PRDO2-T-9-S	T	9	Poor	Yes	0	5%	European	
Plum	PRDO2-U-10-S	U	10	Dead		0	0	European	
Plum	PRDO2-U-11-S	U	11	Poor	Yes	0	20%	European	
Plum	PRDO2-U-12-S	U	12	Fair	No	0	40%	European	
Plum	PRDO2-U-14-S	U	14	Poor	No	0	40%	European	
Plum	PRDO2-U-15-S	U	15	Poor	Yes	0	35%	European	
Plum	PRDO2-U-16-S	U	16	Poor	Yes	0	25%	European	
Plum	PRDO2-U-18-S	U	18	Dead		0	0	European	
Plum	PRDO2-U-19-S	U	19	Poor	Yes	0	15%	European	
Plum	PRDO2-U-6-S	U	6	Poor	Yes	0	1%	European	
Plum	PRDO2-U-7-S	U	7	Poor	Yes	0	1%	European	
Plum	PRDO2-U-8-S	U	8	Dead		0	0	European	
Plum	PRDO2-V-10-S	V	10	Poor	Yes	0	2%	European	
Plum	PRDO2-V-11-S	V	11	Poor	Yes	0	40%	European	
Plum	PRDO2-V-15-S	V	15	Dead	Yes	0	0	European	
Plum	PRDO2-V-16-S	V	16	Poor	Yes	0	10%	European	
Plum	PRDO2-V-19-S	V	19	Poor	Yes	0	10%	European	
Plum	PRDO2-V-20-S	V	20	Poor	No	0	2%	European	
Plum	PRDO2-V-7-S	V	7	Poor	Yes	0	5%	European	
Plum	PRDO2-V-9-S	V	9	Dead	Yes	0	0	European	
Plum	PRDO2-W-10-S	W	10	Poor	Yes	0	20%	European	
Plum	PRDO2-W-11-S	W	11	Poor	Yes	0	25%	European	
Plum	PRDO2-W-12-S	W	12	Dead		0	0	European	
Plum	PRDO2-W-13-S	W	13	Fair	No	0	40%	European	
Plum	PRDO2-W-14-S	W	14	Fair	No	0	40%	European	
Plum	PRDO2-W-15-S	W	15	Fair	Yes	0	50%	European	
Plum	PRDO2-W-18-S	W	18	Poor	Yes	0	5%	European	
Plum	PRDO2-W-7-S	W	7	Poor	Yes	0	10%	European	
Plum	PRDO2-W-8-S	W	8	Poor	Yes	0	5%	European	
Plum	PRDO2-W-9-S	W	9	Poor	Yes	0	35%	European	
Plum	PRDO2-X-10-S	X	10	Poor	Yes	0	15%	European	
Plum	PRDO2-X-11-N	X	11	Dead		0	0	European	
Plum	PRDO2-X-11-S	X	11	Poor	Yes	0	5%	European	
Plum	PRDO2-X-12-S	X	12	Fair	Yes	0	45%	European	
Plum	PRDO2-X-13-S	X	13	Fair	Yes	0	15%	European	
Plum	PRDO2-X-14-S	X	14	Poor	Yes	0	15%	European	
Plum	PRDO2-X-15-S	X	15	Poor	Yes	0	15%	European	
Plum	PRDO2-X-17-S	X	17	Poor	Yes	0	5%	European	
Plum	PRDO2-X-18-S	X	18	Poor	Yes	0	15%	European	
Plum	PRDO2-X-7-S	X	7	Poor	No	0	30%	European	
Plum	PRDO2-X-8-S	X	8	Poor	No	0	5%	European	

Plum	PRDO2-Y-11-N	Y	11	Poor	Yes	0	0	European	Possible peach tree
Plum	PRDO2-Y-13-S	Y	13	Poor	Yes	0	20%	European	
Plum	PRDO2-Y-14-S	Y	14	Poor	Yes	0	5%	European	
Plum	PRDO2-Y-15-S	Y	15	Poor	Yes	0	30%	European	
Plum	PRDO2-Y-17-S	Y	17	Dead	Yes	0	0	European	
Plum	PRDO2-Y-8-S	Y	8	Poor	Yes	0	35%	European	
Plum	PRDO2-Y-9-S	Y	9	Poor	Yes	0	20%	European	
Plum	PRIN-A-14-N	A	14	Fair	No	8"	45%	Damson	
Plum	PRIN-B-13-N	B	13	Poor	Yes	16"	50%	Damson	Tree leaning
Plum	PRIN-F-12-S	F	12	Fair	Yes	0	50%	Damson	
Plum	PRIN-I-8-S	I	8	Poor	Yes	0	70%	Damson	
Plum	PRIN-L-9-S	L	9	Poor	No	0	30%	Damson	

PRUNE CONDITION ASSESSMENT DATA

Prune (*Prunus domestica*)

Tree Condition Table

October 3-6, 2006

SPECIES	TREE ID	ROW	TREE	CONDITION	CAVITY	TRUNK DIAMETER	% LIVE CANOPY	COMMENTS
Prune	PRDO1-A-11	A	11	Poor	Yes	12"	30%	
Prune	PRDO1-A-14	A	14	Poor		0	20%	
Prune	PRDO1-A-15	A	15	Poor	Yes	0	20%	
Prune	PRDO1-A-16	A	16	Dead		0	0	
Prune	PRDO1-A-17	A	17	Poor	Yes	18"	10%	
Prune	PRDO1-A-20	A	20	Poor	Yes	24"	5%	
Prune	PRDO1-A-22	A	22	Dead	Yes	13"	0	
Prune	PRDO1-A-24	A	24	Poor	Yes	12"	20%	
Prune	PRDO1-A-25	A	25	Poor	Yes	8"	30%	
Prune	PRDO1-α-25	α	25	Poor		6"	5%	
Prune	PRDO1-α-26	α	26	Poor		6"	0	
Prune	PRDO1-A-26	A	26	Dead		10"	0	
Prune	PRDO1-A-30	A	30	Dead		0	0	
Prune	PRDO1-A-31	A	31	Dead		12"	0	
Prune	PRDO1-A-6	A	6	Dead		0	0	
Prune	PRDO1-AA-12	AA	12	Fair	Yes	0	40%	
Prune	PRDO1-AA-13	AA	13	Poor	Yes	0	5%	
Prune	PRDO1-AA-14	AA	14	Poor	Yes	0	5%	
Prune	PRDO1-AA-16	AA	16	Dead	Yes	0	0	
Prune	PRDO1-AA-2	AA	2	Poor	Yes	0	5%	
Prune	PRDO1-AA-20	AA	20	Poor	Yes	0	5%	
Prune	PRDO1-AA-22	AA	22	Poor	Yes	0	5%	
Prune	PRDO1-AA-23	AA	23	Poor	Yes	0	5%	
Prune	PRDO1-AA-24	AA	24	Poor	Yes	0	5%	
Prune	PRDO1-AA-25	AA	25	Dead	Yes	0	0	
Prune	PRDO1-AA-26	AA	26	Poor	Yes	0	5%	
Prune	PRDO1-AA-27	AA	27	Poor	Yes	0	5%	
Prune	PRDO1-AA-29	AA	29	Dead	Yes	0	0	
Prune	PRDO1-AA-30	AA	30	Dead	Yes	0	0	
Prune	PRDO1-AA-4	AA	4	Dead	Yes	0	0	
Prune	PRDO1-AA-5	AA	5	Poor	Yes	0	5%	
Prune	PRDO1-AA-8	AA	8	Poor	Yes	0	5%	
Prune	PRDO1-B-12	B	12	Poor	No	0	20%	
Prune	PRDO1-B-13	B	13	Poor	Yes	0	35%	
Prune	PRDO1-B-15	B	15	Poor	Yes	0	5%	
Prune	PRDO1-B-16	B	16	Dead		0	0	
Prune	PRDO1-B-17	B	17	Poor	Yes	0	10%	
Prune	PRDO1-B-18	B	18	Poor	Yes	0	10%	
Prune	PRDO1-B-26	B	26	Poor	Yes	0	20%	
Prune	PRDO1-B-28	B	28	Dead	No	0	0	
Prune	PRDO1-B-29	B	29	Poor	Yes	0	20%	

Prune	PRDO1-BB-20	BB	20	Poor	Yes	0	5%	
Prune	PRDO1-BB-21	BB	21	Dead	Yes	0	0	
Prune	PRDO1-BB-22	BB	22	Poor	Yes	0	5%	
Prune	PRDO1-BB-24	BB	24	Poor	Yes	0	5%	
Prune	PRDO1-BB-25	BB	25	Poor	Yes	0	5%	
Prune	PRDO1-BB-26	BB	26	Poor	Yes	0	5%	
Prune	PRDO1-BB-27	BB	27	Dead	Yes	0	0	
Prune	PRDO1-BB-28	BB	28	Dead	Yes	0	0	
Prune	PRDO1-BB-3	BB	3	Dead	Yes	0	0	
Prune	PRDO1-BB-8	BB	8	Poor	No	0	5%	
Prune	PRDO1-C-12	C	12	Poor	No	0	5%	
Prune	PRDO1-C-13	C	13	Fair	No	0	15%	
Prune	PRDO1-C-14	C	14	Poor	Yes	0	5%	
Prune	PRDO1-C-15	C	15	Poor	Yes	0	15%	
Prune	PRDO1-C-19	C	19	Fair	Yes	0	25%	
Prune	PRDO1-C-20	C	20	Fair	Yes	0	35%	
Prune	PRDO1-C-21	C	21	Poor	Yes	0	20%	
Prune	PRDO1-C-23	C	23	Poor	Yes	0	20%	
Prune	PRDO1-C-23	C	23	Poor	No	0	25%	
Prune	PRDO1-C-26	C	26	Dead	Yes	0	0	
Prune	PRDO1-C-27	C	27	Dead	No	0	0	
Prune	PRDO1-C-29	C	29	Dead	No	0	0	
Prune	PRDO1-CC-20	CC	20	Dead	Yes	0	0	
Prune	PRDO1-CC-21	CC	21	Poor	Yes	0	5%	
Prune	PRDO1-CC-22	CC	22	Poor	Yes	0	5%	
Prune	PRDO1-CC-23	CC	23	Poor	Yes	0	5%	
Prune	PRDO1-CC-25	CC	25	Dead	Yes	0	0	
Prune	PRDO1-CC-27	CC	27	Dead	Yes	0	0	
Prune	PRDO1-D-10	D	10	Dead	Yes	0	0	
Prune	PRDO1-D-12	D	12	Poor	Yes	0	10%	
Prune	PRDO1-D-13	D	13	Fair	Yes	0	50%	
Prune	PRDO1-D-14	D	14	Poor	Yes	0	5%	
Prune	PRDO1-D-15	D	15	Fair	Yes	0	15%	
Prune	PRDO1-D-16	D	16	Poor	Yes	0	7%	
Prune	PRDO1-D-21	D	21	Dead	Yes	0	0	Stump
Prune	PRDO1-D-23	D	23	Poor	Yes	0	3%	Stump
Prune	PRDO1-D-24	D	24	Dead	Yes	0	0	Stump
Prune	PRDO1-D-25	D	25	Dead	No	0	0	Stump
Prune	PRDO1-D-26	D	26	Poor	Yes	0	10%	
Prune	PRDO1-D-27	D	27	Dead	No	0	0	
Prune	PRDO1-D-29	D	29	Dead	No	0	0	
Prune	PRDO1-DD-19	DD	19	Dead	Yes	0	0	
Prune	PRDO1-DD-20	DD	20	Poor	Yes	0	10%	
Prune	PRDO1-DD-21	DD	21	Poor	Yes	0	10%	
Prune	PRDO1-DD-23	DD	23	Fair	Yes	0	30%	
Prune	PRDO1-DD-24	DD	24	Dead	Yes	0	0	
Prune	PRDO1-DD-25	DD	25	Poor	Yes	0	5%	
Prune	PRDO1-DD-26	DD	26	Poor	Yes	0	5%	
Prune	PRDO1-DD-27	DD	27	Dead	Yes	0	0	
Prune	PRDO1-E-10	E	10	Dead		0	0	
Prune	PRDO1-E-11	E	11	Dead		0	0	

Prune	PRDO1-E-13	E	13	Poor	Yes	0	5%	
Prune	PRDO1-E-14	E	14	Poor	Yes	0	20%	
Prune	PRDO1-E-15	E	15	Poor	Yes	0	20%	
Prune	PRDO1-E-16	E	16	Dead		0	0	
Prune	PRDO1-E-17	E	17	Poor	Yes	0	35%	
Prune	PRDO1-E-18	E	18	Poor	Yes	0	25%	
Prune	PRDO1-E-19	E	19	Poor	Yes	0	40%	
Prune	PRDO1-E-20	E	20	Poor	Yes	0	30%	
Prune	PRDO1-E-21	E	21	Poor	Yes	0	40%	
Prune	PRDO1-E-22	E	22	Poor	Yes	0	45%	
Prune	PRDO1-E-23	E	23	Poor	No	17"	5%	
Prune	PRDO1-E-24	E	24	Poor	No	0	20%	
Prune	PRDO1-E-26	E	26	Poor	No	0	25%	
Prune	PRDO1-E-27	E	27	Dead		0	0	
Prune	PRDO1-E-30	E	30	Poor	Yes	0	10%	
Prune	PRDO1-EE-24	EE	24	Poor	Yes	0	10%	
Prune	PRDO1-EE-26	EE	26	Fair	Yes	0	45%	
Prune	PRDO1-F-08	F	08	Dead	Yes	0	0	Root sprout
Prune	PRDO1-F-15	F	15	Dead	Yes	0	0	
Prune	PRDO1-F-16	F	16	Dead	Yes	0	0	
Prune	PRDO1-F-18	F	18	Fair	Yes	0	25%	
Prune	PRDO1-F-22	F	22	Poor	Yes	0	10%	
Prune	PRDO1-F-23	F	23	Dead	Yes	0	0	
Prune	PRDO1-F-24	F	24	Poor	Yes	0	8%	
Prune	PRDO1-F-25	F	25	Poor	No	0	10%	
Prune	PRDO1-F-26	F	26	Poor	Yes	0	12%	
Prune	PRDO1-F-27	F	27	Dead	No	0	0	
Prune	PRDO1-F-28	F	28	Dead	No	0	0	
Prune	PRDO1-F-31	F	31	Dead	No	0	0	
Prune	PRDO1-F-33	F	33	Dead	No	0	0	
Prune	PRDO1-G-12	G	12	Poor	No	0	25%	
Prune	PRDO1-G-14	G	14	Dead		0	0	
Prune	PRDO1-G-16	G	16	Dead		0	0	
Prune	PRDO1-G-17	G	17	Poor	No	0	10%	
Prune	PRDO1-G-19	G	19	Poor	Yes	0	10%	
Prune	PRDO1-G-20	G	20	Poor	Yes	0	20%	
Prune	PRDO1-G-22	G	22	Poor	Yes	0	10%	
Prune	PRDO1-G-23	G	23	Poor	Yes	0	20%	
Prune	PRDO1-G-25	G	25	Poor	Yes	0	5%	
Prune	PRDO1-G-26	G	26	Dead		0	0	
Prune	PRDO1-G-28	G	28	Poor	Yes	0	10%	
Prune	PRDO1-G-32	G	32	Poor	Yes	0	5%	
Prune	PRDO1-G-34	G	34	Poor	Yes	0	5%	
Prune	PRDO1-G-35	G	35	Poor	Yes	0	45%	
Prune	PRDO1-G-36	G	36	Fair	No	0	60%	
Prune	PRDO1-G-8	G	8	Dead		0	0	
Prune	PRDO1-H-08	H	08	Poor	No	0	5%	
Prune	PRDO1-H-09	H	09	Dead	No	0	0	
Prune	PRDO1-H-11	H	11	Poor	Yes	0	5%	
Prune	PRDO1-H-16	H	16	Fair	Yes	0	8%	
Prune	PRDO1-H-17	H	17	Poor	Yes	0	2%	

Prune	PRDO1-H-18	H	18	Poor	Yes	0	5%	
Prune	PRDO1-H-19	H	19	Poor	Yes	0	0	Root sprout
Prune	PRDO1-H-20	H	20	Dead	Yes	0	0	
Prune	PRDO1-H-21	H	21	Fair	Yes	0	25%	
Prune	PRDO1-H-22	H	22	Fair	Yes	0	35%	
Prune	PRDO1-H-23	H	23	Poor	Yes	0	20%	
Prune	PRDO1-H-25	H	25	Poor	No	0	15%	
Prune	PRDO1-H-27	H	27	Poor	No	0	2%	
Prune	PRDO1-H-28	H	28	Poor	Yes	0	5%	
Prune	PRDO1-H-32	H	32	Poor	Yes	0	20%	
Prune	PRDO1-H-36	H	36	Dead	No	0	0	
Prune	PRDO1-H-37	H	37	Poor	Yes	0	10%	
Prune	PRDO1-H-38	H	38	Fair	Yes	0	50%	
Prune	PRDO1-I-13	I	13	Dead		0	0	
Prune	PRDO1-I-15	I	15	Dead		0	0	
Prune	PRDO1-I-16	I	16	Poor	Yes	18"	10%	
Prune	PRDO1-I-19	I	19	Poor	Yes	0	25%	
Prune	PRDO1-I-21	I	21	Poor	No	0	30%	
Prune	PRDO1-I-22	I	22	Poor	Yes	0	20%	
Prune	PRDO1-I-23	I	23	Poor	Yes	0	10%	
Prune	PRDO1-I-26	I	26	Dead		0	0	
Prune	PRDO1-I-27	I	27	Poor	Yes	0	20%	
Prune	PRDO1-I-28	I	28	Poor	Yes	0	1%	
Prune	PRDO1-I-29	I	29	Poor	No	0	20%	
Prune	PRDO1-I-31	I	31	Poor	Yes	0	1%	
Prune	PRDO1-I-34	I	34	Poor	Yes	0	1%	
Prune	PRDO1-I-36	I	36	Poor	Yes	0	5%	
Prune	PRDO1-I-39	I	39	Poor	No	0	30%	
Prune	PRDO1-I-8	I	8	Poor	No	0	15%	
Prune	PRDO1-I-9	I	9	Poor	Yes	0	30%	
Prune	PRDO1-J-13	J	13	Dead	Yes	0	1%	
Prune	PRDO1-J-16	J	16	Poor	Yes	0	1%	
Prune	PRDO1-J-17	J	17	Poor	Yes	0	30%	
Prune	PRDO1-J-18	J	18	Poor	Yes	0	5%	
Prune	PRDO1-J-19	J	19	Fair	Yes	0	30%	
Prune	PRDO1-J-22	J	22	Fair	Yes	0	25%	
Prune	PRDO1-J-23	J	23	Fair	Yes	0	30%	
Prune	PRDO1-J-25	J	25	Poor	Yes	0	3%	
Prune	PRDO1-J-27	J	27	Poor	Yes	0	5%	
Prune	PRDO1-J-28	J	28	Poor	Yes	0	15%	
Prune	PRDO1-J-29	J	29	Poor	Yes	0	2%	
Prune	PRDO1-J-30	J	30	Dead	Yes	0	0	
Prune	PRDO1-J-31	J	31	Fair	Yes	0	15%	
Prune	PRDO1-J-32	J	32	Dead	Yes	0	0	
Prune	PRDO1-J-33	J	33	Poor	Yes	0	5%	
Prune	PRDO1-J-36	J	36	Poor	Yes	0	5%	
Prune	PRDO1-J-37	J	37	Poor	Yes	0	5%	
Prune	PRDO1-J-38	J	38	Fair	Yes	0	25%	
Prune	PRDO1-J-39	J	39	Dead	Yes	0	0	
Prune	PRDO1-J-5	J	5	Dead	No	0	0	
Prune	PRDO1-J-8	J	8	Poor	No	0	10%	

Prune	PRDO1-J-9	J	9	Poor	Yes	0	10%	
Prune	PRDO1-K-1	K	1	Dead		0	0	
Prune	PRDO1-K-10	K	10	Dead		0	0	
Prune	PRDO1-K-11	K	11	Dead		0	0	
Prune	PRDO1-K-16	K	16	Poor	Yes	0	5%	
Prune	PRDO1-K-17	K	17	Poor	Yes	0	1%	
Prune	PRDO1-K-18	K	18	Poor	Yes	0	25%	
Prune	PRDO1-K-19	K	19	Poor	Yes	0	40%	
Prune	PRDO1-K-20	K	20	Poor	No	0	35%	
Prune	PRDO1-K-21	K	21	Poor	Yes	0	5%	
Prune	PRDO1-K-22	K	22	Poor	Yes	0	30%	
Prune	PRDO1-K-24	K	24	Poor	No	0	30%	
Prune	PRDO1-K-25	K	25	Dead		0	0	
Prune	PRDO1-K-27	K	27	Poor	No	0	1%	
Prune	PRDO1-K-28	K	28	Dead		0	0	
Prune	PRDO1-K-29	K	29	Poor	Yes	0	40%	
Prune	PRDO1-K-31	K	31	Poor	Yes	0	20%	
Prune	PRDO1-K-33	K	33	Dead		0	0	
Prune	PRDO1-K-34	K	34	Dead		0	0	
Prune	PRDO1-K-35	K	35	Dead		0	0	
Prune	PRDO1-K-37	K	37	Poor	Yes	0	45%	
Prune	PRDO1-K-38	K	38	Poor	No	0	20%	
Prune	PRDO1-K-39	K	39	Poor	Yes	0	5%	
Prune	PRDO1-K-4	K	4	Dead		0	0	
Prune	PRDO1-K-7	K	7	Dead		0	0	
Prune	PRDO1-K-9	K	9	Poor	Yes	0	10%	
Prune	PRDO1-L-1	L	1	Dead	No	0	0	
Prune	PRDO1-L-10	L	10	Poor	Yes	0	6%	
Prune	PRDO1-L-12	L	12	Dead	Yes	0	0	
Prune	PRDO1-L-15	L	15	Poor	Yes	0	6%	
Prune	PRDO1-L-17	L	17	Fair	Yes	0	33%	
Prune	PRDO1-L-18	L	18	Fair	Yes	0	30%	
Prune	PRDO1-L-19	L	19	Poor	Yes	0	40%	
Prune	PRDO1-L-20	L	20	Dead	Yes	0	0	
Prune	PRDO1-L-22	L	22	Fair	Yes	0	25%	
Prune	PRDO1-L-23	L	23	Poor	Yes	0	15%	
Prune	PRDO1-L-24	L	24	Poor	Yes	0	15%	
Prune	PRDO1-L-25	L	25	Poor	Yes	0	20%	
Prune	PRDO1-L-26	L	26	Poor	Yes	0	5%	
Prune	PRDO1-L-27	L	27	Poor	Yes	0	10%	
Prune	PRDO1-L-28	L	28	Poor	Yes	0	5%	
Prune	PRDO1-L-29	L	29	Poor	Yes	0	5%	
Prune	PRDO1-L-3	L	3	Dead	No	0	0	
Prune	PRDO1-L-30	L	30	Poor	Yes	0	8%	
Prune	PRDO1-L-32	L	32	Dead	Yes	0	0	
Prune	PRDO1-L-34	L	34	Poor	Yes	0	10%	
Prune	PRDO1-L-35	L	35	Poor	Yes	0	15%	
Prune	PRDO1-L-37	L	37	Dead	Yes	0	0	
Prune	PRDO1-L-39	L	39	Poor	Yes	0	10%	
Prune	PRDO1-L-9	L	9	Poor	Yes	0	5%	
Prune	PRDO1-M-11	M	11	Poor	Yes	0	20%	

Prune	PRDO1-M-12	M	12	Dead		0	0	
Prune	PRDO1-M-13	M	13	Dead		0	0	
Prune	PRDO1-M-14	M	14	Dead		0	0	
Prune	PRDO1-M-15	M	15	Dead		0	0	
Prune	PRDO1-M-17	M	17	Poor	Yes	0	35%	
Prune	PRDO1-M-18	M	18	Poor	Yes	0	1%	
Prune	PRDO1-M-19	M	19	Poor	No	0	15%	
Prune	PRDO1-M-20	M	20	Poor	Yes	0	20%	
Prune	PRDO1-M-21	M	21	Poor	Yes	0	10%	
Prune	PRDO1-M-22	M	22	Poor	Yes	0	30%	
Prune	PRDO1-M-24	M	24	Fair	No	0	30%	
Prune	PRDO1-M-25	M	25	Poor	No	0	5%	
Prune	PRDO1-M-26	M	26	Poor	No	0	20%	
Prune	PRDO1-M-27	M	27	Poor	Yes	0	5%	
Prune	PRDO1-M-28	M	28	Poor	No	0	20%	
Prune	PRDO1-M-29	M	29	Poor	Yes	0	5%	
Prune	PRDO1-M-3	M	3	Poor	Yes	0	20%	
Prune	PRDO1-M-31	M	31	Poor	Yes	0	5%	
Prune	PRDO1-M-33	M	33	Poor	Yes	0	1%	
Prune	PRDO1-M-34	M	34	Dead		0	0	
Prune	PRDO1-M-35	M	35	Poor	Yes	0	30%	
Prune	PRDO1-M-36	M	36	Poor	Yes	18"	30%	
Prune	PRDO1-M-37	M	37	Poor	Yes	0	1%	
Prune	PRDO1-M-4	M	4	Dead		0	0	
Prune	PRDO1-M-5	M	5	Dead		0	0	
Prune	PRDO1-M-6	M	6	Dead		0	0	
Prune	PRDO1-N-1	N	1	Dead	Yes	0	0	
Prune	PRDO1-N-14	N	14	Poor	Yes	0	20%	
Prune	PRDO1-N-18	N	18	Fair	No	0	25%	
Prune	PRDO1-N-19	N	19	Poor	Yes	0	5%	
Prune	PRDO1-N-24	N	24	Dead	Yes	0	0	
Prune	PRDO1-N-26	N	26	Poor	Yes	0	5%	
Prune	PRDO1-N-27	N	27	Poor	Yes	0	5%	
Prune	PRDO1-N-28	N	28	Fair	Yes	0	40%	
Prune	PRDO1-N-30	N	30	Poor	Yes	0	5%	
Prune	PRDO1-N-31	N	31	Poor	Yes	0	15%	
Prune	PRDO1-N-33	N	33	Dead	No	0	0	
Prune	PRDO1-N-34	N	34	Fair	No	0	15%	
Prune	PRDO1-N-35	N	35	Dead	Yes	0	0	
Prune	PRDO1-N-36	N	36	Poor	Yes	0	5%	
Prune	PRDO1-N-37	N	37	Dead	Yes	0	0	
Prune	PRDO1-N-4	N	4	Dead	Yes	0	0	
Prune	PRDO1-N-7	N	7	Poor	Yes	0	10%	
Prune	PRDO1-N-8	N	8	Dead	Yes	0	0	
Prune	PRDO1-O-1	O	1	Dead	No	0	0	
Prune	PRDO1-O-18	O	18	Poor	Yes	0	5%	
Prune	PRDO1-O-19	O	19	Fair	Yes	0	60%	
Prune	PRDO1-O-20	O	20	Poor	Yes	0	20%	
Prune	PRDO1-O-22	O	22	Poor	Yes	0	15%	
Prune	PRDO1-O-23	O	23	Dead		0	0	
Prune	PRDO1-O-24	O	24	Fair	No	0	25%	

Prune	PRDO1-O-25	O	25	Fair	No	0	35%	
Prune	PRDO1-O-26	O	26	Dead		0	0	
Prune	PRDO1-O-27	O	27	Dead		0	0	
Prune	PRDO1-O-28	O	28	Poor	Yes	0	30%	
Prune	PRDO1-O-29	O	29	Poor	Yes	0	15%	
Prune	PRDO1-O-30	O	30	Fair	Yes	0	60%	
Prune	PRDO1-O-31	O	31	Poor	Yes	0	20%	
Prune	PRDO1-O-32	O	32	Poor	No	0	20%	
Prune	PRDO1-O-33	O	33	Poor	Yes	0	20%	
Prune	PRDO1-O-34	O	34	Poor	Yes	0	30%	
Prune	PRDO1-O-35	O	35	Poor	No	0	35%	
Prune	PRDO1-O-38	O	38	Poor	Yes	0	25%	
Prune	PRDO1-O-4	O	4	Poor	Yes	0	20%	
Prune	PRDO1-O-6	O	6	Dead	Yes	0	0	
Prune	PRDO1-O-8	O	8	Poor	Yes	0	15%	
Prune	PRDO1-P-1	P	1	Poor	No	0	5%	
Prune	PRDO1-P-11	P	11	Dead	Yes	0	0	
Prune	PRDO1-P-12	P	12	Poor	Yes	0	20%	
Prune	PRDO1-P-16	P	16	Poor	Yes	0	15%	
Prune	PRDO1-P-17	P	17	Poor	Yes	0	25%	
Prune	PRDO1-P-18	P	18	Poor	Yes	0	5%	
Prune	PRDO1-P-19	P	19	Dead	Yes	0	0	
Prune	PRDO1-P-20	P	20	Poor	Yes	0	35%	
Prune	PRDO1-P-24	P	24	Poor	Yes	0	15%	
Prune	PRDO1-P-25	P	25	Poor	Yes	0	40%	
Prune	PRDO1-P-27	P	27	Poor	Yes	0	30%	
Prune	PRDO1-P-28	P	28	Dead	Yes	0	0	
Prune	PRDO1-P-29	P	29	Poor	Yes	0	10%	
Prune	PRDO1-P-30	P	30	Dead	Yes	0	0	
Prune	PRDO1-P-31	P	31	Poor	Yes	0	10%	
Prune	PRDO1-P-33	P	33	Poor	Yes	0	20%	
Prune	PRDO1-P-35	P	35	Poor	Yes	0	10%	
Prune	PRDO1-P-36	P	36	Poor	No	0	20%	
Prune	PRDO1-P-7	P	7	Dead	No	0	0	
Prune	PRDO1-P-8	P	8	Poor	Yes	0	5%	
Prune	PRDO1-Q-1	Q	1	Dead	No	0	0	
Prune	PRDO1-Q-10	Q	10	Dead	Yes	0	0	
Prune	PRDO1-Q-11	Q	11	Dead	Yes	0	0	
Prune	PRDO1-Q-12	Q	12	Poor	Yes	0	2%	
Prune	PRDO1-Q-14	Q	14	Poor	Yes	0	10%	
Prune	PRDO1-Q-16	Q	16	Poor	Yes	0	10%	
Prune	PRDO1-Q-17	Q	17	Poor	Yes	0	10%	
Prune	PRDO1-Q-18	Q	18	Dead	Yes	0	0	
Prune	PRDO1-Q-19	Q	19	Poor	Yes	0	5%	
Prune	PRDO1-Q-20	Q	20	Poor	Yes	0	10%	
Prune	PRDO1-Q-22	Q	22	Dead	Yes	0	0	
Prune	PRDO1-Q-23	Q	23	Dead	Yes	0	0	
Prune	PRDO1-Q-24	Q	24	Poor	Yes	0	10%	
Prune	PRDO1-Q-25	Q	25	Poor	Yes	0	10%	
Prune	PRDO1-Q-27	Q	27	Dead	Yes	0	0	
Prune	PRDO1-Q-28	Q	28	Poor	Yes	0	15%	

Prune	PRDO1-Q-29	Q	29	Poor	Yes	0	15%	
Prune	PRDO1-Q-3	Q	3	Dead	No	0	0	
Prune	PRDO1-Q-30	Q	30	Poor	Yes	0	15%	
Prune	PRDO1-Q-31	Q	31	Poor	Yes	0	20%	
Prune	PRDO1-Q-32	Q	32	Poor	Yes	0	20%	
Prune	PRDO1-Q-33	Q	33	Poor	Yes	0	40%	
Prune	PRDO1-Q-34	Q	34	Poor	Yes	0	15%	
Prune	PRDO1-Q-35	Q	35	Dead	Yes	0	0	
Prune	PRDO1-Q-36	Q	36	Poor	Yes	0	10%	
Prune	PRDO1-Q-4	Q	4	Poor	Yes	0	10%	
Prune	PRDO1-Q-5	Q	5	Dead	Yes	0	0	
Prune	PRDO1-Q-7	Q	7	Dead	Yes	0	0	
Prune	PRDO1-Q-8	Q	8	Dead	Yes	0	0	
Prune	PRDO1-R-1	R	1	Dead	Yes	0	0	
Prune	PRDO1-R-13	R	13	Poor	No	0	15%	
Prune	PRDO1-R-15	R	15	Dead	Yes	0	0	
Prune	PRDO1-R-16	R	16	Poor	Yes	0	5%	
Prune	PRDO1-R-17	R	17	Poor	Yes	0	5%	
Prune	PRDO1-R-18	R	18	Poor	Yes	0	10%	
Prune	PRDO1-R-19	R	19	Poor	Yes	0	10%	
Prune	PRDO1-R-20	R	20	Poor	Yes	0	10%	
Prune	PRDO1-R-21	R	21	Poor	Yes	0	5%	
Prune	PRDO1-R-22	R	22	Poor	Yes	0	5%	
Prune	PRDO1-R-25	R	25	Poor	Yes	0	5%	
Prune	PRDO1-R-26	R	26	Poor	Yes	0	25%	
Prune	PRDO1-R-27	R	27	Dead	Yes	0	0	
Prune	PRDO1-R-28	R	28	Poor	Yes	0	10%	Root sprout
Prune	PRDO1-R-29	R	29	Poor	Yes	0	20%	
Prune	PRDO1-R-3	R	3	Poor	Yes	0	20%	
Prune	PRDO1-R-31	R	31	Dead	Yes	0	0	
Prune	PRDO1-R-32	R	32	Dead	Yes	0	0	
Prune	PRDO1-R-33	R	33	Poor	Yes	0	20%	
Prune	PRDO1-R-34	R	34	Poor	Yes	0	20%	
Prune	PRDO1-R-35	R	35	Poor	Yes	0	20%	
Prune	PRDO1-R-36	R	36	Dead	Yes	0	0	
Prune	PRDO1-R-4	R	4	Poor	Yes	0	5%	
Prune	PRDO1-R-5	R	5	Poor	Yes	0	5%	
Prune	PRDO1-R-8	R	8	Poor	Yes	0	15%	
Prune	PRDO1-R-9	R	9	Poor	Yes	0	15%	
Prune	PRDO1-S-11	S	11	Poor	Yes	0	10%	
Prune	PRDO1-S-12	S	12	Poor	Yes	0	5%	
Prune	PRDO1-S-13	S	13	Dead	Yes	0	0	
Prune	PRDO1-S-14	S	14	Poor	Yes	0	10%	
Prune	PRDO1-S-15	S	15	Poor	Yes	0	15%	
Prune	PRDO1-S-17	S	17	Poor	Yes	0	5%	
Prune	PRDO1-S-18	S	18	Dead	Yes	0	0	
Prune	PRDO1-S-19	S	19	Dead	Yes	0	0	
Prune	PRDO1-S-2	S	2	Dead	Yes	0	0	
Prune	PRDO1-S-20	S	20	Poor	Yes	0	10%	
Prune	PRDO1-S-21	S	21	Poor	Yes	0	20%	
Prune	PRDO1-S-22	S	22	Dead	Yes	0	0	

Prune	PRDO1-S-23	S	23	Poor	Yes	0	10%	
Prune	PRDO1-S-24	S	24	Poor	Yes	0	10%	
Prune	PRDO1-S-25	S	25	Dead	Yes	0	0	
Prune	PRDO1-S-26	S	26	Poor	Yes	0	5%	
Prune	PRDO1-S-27	S	27	Poor	Yes	0	5%	
Prune	PRDO1-S-28	S	28	Poor	Yes	0	20%	
Prune	PRDO1-S-29	S	29	Poor	Yes	0	10%	
Prune	PRDO1-S-31	S	31	Poor	Yes	0	10%	
Prune	PRDO1-S-32	S	32	Poor	No	0	10%	
Prune	PRDO1-S-33	S	33	Dead	No	0	0	
Prune	PRDO1-S-34	S	34	Dead	No	0	0	
Prune	PRDO1-S-35	S	35	Poor	No	0	5%	
Prune	PRDO1-S-4	S	4	Poor	Yes	0	5%	
Prune	PRDO1-S-9	S	9	Poor	Yes	0	10%	
Prune	PRDO1-T-1	T	1	Dead	No	0	0	
Prune	PRDO1-T-10	T	10	Poor	Yes	0	5%	
Prune	PRDO1-T-11	T	11	Dead	Yes	0	0	
Prune	PRDO1-T-12	T	12	Poor	Yes	0	5%	
Prune	PRDO1-T-13	T	13	Poor	Yes	0	5%	
Prune	PRDO1-T-14	T	14	Poor	Yes	0	5%	
Prune	PRDO1-T-15	T	15	Poor	Yes	0	5%	
Prune	PRDO1-T-16	T	16	Poor	Yes	0	5%	
Prune	PRDO1-T-17	T	17	Poor	Yes	0	15%	
Prune	PRDO1-T-19	T	19	Poor	Yes	0	15%	
Prune	PRDO1-T-20	T	20	Poor	Yes	0	15%	
Prune	PRDO1-T-21	T	21	Poor	Yes	0	25%	
Prune	PRDO1-T-25	T	25	Poor	Yes	0	5%	
Prune	PRDO1-T-26	T	26	Dead	Yes	0	0	
Prune	PRDO1-T-27	T	27	Poor	Yes	0	5%	
Prune	PRDO1-T-28	T	28	Poor	Yes	0	5%	
Prune	PRDO1-T-29	T	29	Poor	Yes	0	10%	
Prune	PRDO1-T-30	T	30	Poor	No	0	5%	Root sprout
Prune	PRDO1-T-31	T	31	Poor	No	0	10%	
Prune	PRDO1-T-32	T	32	Poor	No	0	10%	
Prune	PRDO1-T-34	T	34	Poor	No	0	5%	
Prune	PRDO1-T-9	T	9	Poor	No	0	5%	
Prune	PRDO1-U-1	U	1	Poor	No	0	5%	
Prune	PRDO1-U-10	U	10	Poor	No	0	5%	
Prune	PRDO1-U-11	U	11	Poor	No	0	5%	
Prune	PRDO1-U-12	U	12	Poor	No	0	15%	
Prune	PRDO1-U-13	U	13	Poor	No	0	15%	
Prune	PRDO1-U-14	U	14	Poor	No	0	5%	
Prune	PRDO1-U-15	U	15	Poor	No	0	5%	
Prune	PRDO1-U-16	U	16	Poor	No	0	5%	
Prune	PRDO1-U-19	U	19	Poor	No	0	5%	
Prune	PRDO1-U-20	U	20	Poor	No	0	5%	
Prune	PRDO1-U-22	U	22	Dead	No	0	0	
Prune	PRDO1-U-23	U	23	Dead	No	0	0	
Prune	PRDO1-U-24	U	24	Poor	No	0	5%	
Prune	PRDO1-U-25	U	25	Poor	Yes	0	5%	
Prune	PRDO1-U-26	U	26	Poor	Yes	0	5%	

Prune	PRDO1-U-27	U	27	Dead	Yes	0	0	
Prune	PRDO1-U-28	U	28	Poor	Yes	0	20%	
Prune	PRDO1-U-29	U	29	Poor	Yes	0	25%	
Prune	PRDO1-U-30	U	30	Dead	Yes	0	0	
Prune	PRDO1-U-31	U	31	Dead	Yes	0	0	
Prune	PRDO1-U-32	U	32	Poor	Y	0	5%	
Prune	PRDO1-U-33	U	33	Dead	Yes	0	0	
Prune	PRDO1-U-5	U	5	Dead	No	0	0	
Prune	PRDO1-U-7	U	7	Poor	No	0	5%	Root sprout
Prune	PRDO1-V-10	V	10	Poor	Yes	0	5%	
Prune	PRDO1-V-11	V	11	Poor	Yes	0	5%	
Prune	PRDO1-V-12	V	12	Dead	Yes	0	0	
Prune	PRDO1-V-13	V	13	Poor	Yes	0	5%	
Prune	PRDO1-V-14	V	14	Poor	Yes	0	5%	
Prune	PRDO1-V-15	V	15	Poor	Yes	0	20%	
Prune	PRDO1-V-16	V	16	Poor	Yes	0	5%	
Prune	PRDO1-V-17	V	17	Poor	Yes	0	5%	
Prune	PRDO1-V-19	V	19	Dead	Yes	0	0	
Prune	PRDO1-V-2	V	2	Poor	Yes	0	5%	
Prune	PRDO1-V-20	V	20	Poor	No	0	20%	
Prune	PRDO1-V-21	V	21	Dead	Yes	0	0	
Prune	PRDO1-V-22	V	22	Dead	Yes	0	0	
Prune	PRDO1-V-24	V	24	Dead	Yes	0	0	
Prune	PRDO1-V-25	V	25	Poor	Yes	0	5%	
Prune	PRDO1-V-26	V	26	Poor	Yes	0	5%	
Prune	PRDO1-V-27	V	27	Dead	Yes	0	0	
Prune	PRDO1-V-29	V	29	Dead	Yes	0	0	
Prune	PRDO1-V-30	V	30	Dead	Yes	0	0	
Prune	PRDO1-V-31	V	31	Dead	Yes	0	0	
Prune	PRDO1-V-32	V	32	Dead	Yes	0	0	
Prune	PRDO1-V-5	V	5	Dead	Yes	0	0	
Prune	PRDO1-V-8	V	8	Dead	Yes	0	0	
Prune	PRDO1-W-10	W	10	Dead	Yes	0	0	Root sprout
Prune	PRDO1-W-11	W	11	Poor	Yes	0	5%	
Prune	PRDO1-W-12	W	12	Poor	Yes	0	5%	
Prune	PRDO1-W-13	W	13	Poor	Yes	0	5%	
Prune	PRDO1-W-14	W	14	Poor	Yes	0	5%	
Prune	PRDO1-W-15	W	15	Poor	Yes	0	5%	
Prune	PRDO1-W-16	W	16	Dead	Yes	0	0	
Prune	PRDO1-W-17	W	17	Poor	Yes	0	5%	
Prune	PRDO1-W-19	W	19	Dead	Yes	0	0	
Prune	PRDO1-W-21	W	21	Dead	Yes	0	0	
Prune	PRDO1-W-22	W	22	Dead	Yes	0	0	
Prune	PRDO1-W-23	W	23	Poor	Yes	0	5%	
Prune	PRDO1-W-24	W	24	Poor	Yes	0	5%	
Prune	PRDO1-W-25	W	25	Dead	Yes	0	0	
Prune	PRDO1-W-26	W	26	Dead	Yes	0	0	
Prune	PRDO1-W-28	W	28	Fair	Yes	0	40%	
Prune	PRDO1-W-29	W	29	Poor	Yes	0	10%	
Prune	PRDO1-W-3	W	3	Poor	Yes	0	5%	
Prune	PRDO1-W-30	W	30	Poor	No	0	35%	

Prune	PRDO1-W-31	W	31	Poor	No	0	20%	
Prune	PRDO1-W-33	W	33	Poor	No	0	5%	
Prune	PRDO1-W-7	W	7	Poor	Yes	0	5%	
Prune	PRDO1-W-8	W	8	Poor	Yes	0	5%	
Prune	PRDO1-W-9	W	9	Poor	Yes	0	5%	
Prune	PRDO1-X-10	X	10	Poor	Yes	0	5%	
Prune	PRDO1-X-12	X	12	Dead	Yes	0	0	
Prune	PRDO1-X-14	X	14	Poor	Yes	0	5%	
Prune	PRDO1-X-15	X	15	Poor	Yes	0	5%	
Prune	PRDO1-X-16	X	16	Poor	Yes	0	5%	
Prune	PRDO1-X-17	X	17	Poor	Yes	0	5%	
Prune	PRDO1-X-19	X	19	Poor	No	0	5%	
Prune	PRDO1-X-21	X	21	Dead	No	0	0	
Prune	PRDO1-X-23	X	23	Poor	No	0	5%	
Prune	PRDO1-X-25	X	25	Poor	No	0	5%	
Prune	PRDO1-X-26	X	26	Dead	No	0	0	
Prune	PRDO1-X-29	X	29	Poor	No	0	5%	
Prune	PRDO1-X-30	X	30	Poor	No	0	10%	
Prune	PRDO1-X-31	X	31	Poor	No	0	10%	
Prune	PRDO1-X-32	X	32	Poor	No	0	15%	
Prune	PRDO1-X-33	X	33	Poor	No	0	5%	
Prune	PRDO1-X-5	X	5	Dead	Yes	0	0	
Prune	PRDO1-X-7	X	7	Dead	Yes	0	0	
Prune	PRDO1-X-8	X	8	Dead	Yes	0	0	
Prune	PRDO1-Y-1	Y	1	Dead	Yes	0	0	
Prune	PRDO1-Y-10	Y	10	Poor	No	0	5%	
Prune	PRDO1-Y-11	Y	11	Dead	No	0	0	
Prune	PRDO1-Y-12	Y	12	Poor	Yes	0	5%	
Prune	PRDO1-Y-13	Y	13	Poor	Yes	0	5%	Root sprout
Prune	PRDO1-Y-14	Y	14	Poor	Yes	0	5%	
Prune	PRDO1-Y-15	Y	15	Poor	Yes	0	5%	
Prune	PRDO1-Y-16	Y	16	Poor	Yes	0	5%	
Prune	PRDO1-Y-17	Y	17	Poor	Yes	0	5%	
Prune	PRDO1-Y-19	Y	19	Poor	Yes	0	5%	
Prune	PRDO1-Y-2	Y	2	Dead	Yes	0	0	
Prune	PRDO1-Y-20	Y	20	Dead	Yes	0	0	
Prune	PRDO1-Y-21	Y	21	Poor	Yes	0	5%	
Prune	PRDO1-Y-23	Y	23	Dead	Yes	0	0	
Prune	PRDO1-Y-25	Y	25	Dead	Yes	0	0	
Prune	PRDO1-Y-26	Y	26	Poor	Yes	0	5%	
Prune	PRDO1-Y-27	Y	27	Poor	Yes	0	5%	Root sprout
Prune	PRDO1-Y-28	Y	28	Dead	Yes	0	0	Root sprout
Prune	PRDO1-Y-29	Y	29	Dead	Yes	0	0	Root sprout
Prune	PRDO1-Y-30	Y	30	Poor	No	0	15%	Root sprout
Prune	PRDO1-Y-31	Y	31	Poor	Yes	0	10%	Root sprout
Prune	PRDO1-Y-32	Y	32	Poor	Yes	0	5%	Root sprout
Prune	PRDO1-Y-33	Y	33	Poor	Yes	0	5%	Root sprout
Prune	PRDO1-Y-6	Y	6	Poor	No	0	25%	
Prune	PRDO1-Y-7	Y	7	Poor	No	0	5%	
Prune	PRDO1-Y-8	Y	8	Dead	No	0	0	
Prune	PRDO1-Y-9	Y	9	Dead	No	0	0	

Prune	PRDO1-Z-1	Z	1	Poor	Yes	0	5%	
Prune	PRDO1-Z-11	Z	11	Poor	Yes	0	5%	
Prune	PRDO1-Z-12	Z	12	Dead	Yes	0	0	
Prune	PRDO1-Z-13	Z	13	Poor	Yes	0	5%	
Prune	PRDO1-Z-15	Z	15	Poor	Yes	0	5%	
Prune	PRDO1-Z-16	Z	16	Dead	Yes	0	0	
Prune	PRDO1-Z-17	Z	17	Dead	Yes	0	0	
Prune	PRDO1-Z-18	Z	18	Poor	Yes	0	5%	
Prune	PRDO1-Z-19	Z	19	Poor	Yes	0	5%	
Prune	PRDO1-Z-21	Z	21	Poor	Yes	0	5%	Root sprout
Prune	PRDO1-Z-24	Z	24	Dead	Yes	0	0	Root sprout
Prune	PRDO1-Z-25	Z	25	Poor	Yes	0	5%	Root sprout
Prune	PRDO1-Z-26	Z	26	Poor	Yes	0	5%	Root sprout
Prune	PRDO1-Z-27	Z	27	Poor	Yes	0	5%	Root sprout
Prune	PRDO1-Z-28	Z	28	Poor	Yes	0	5%	Root sprout
Prune	PRDO1-Z-3	Z	3	Dead	Yes	0	0	
Prune	PRDO1-Z-30	Z	30	Dead	Yes	0	0	Root sprout
Prune	PRDO1-Z-32	Z	32	Poor	Yes	0	5%	Root sprout
Prune	PRDO1-Z-4	Z	4	Poor	Yes	0	10%	
Prune	PRDO1-Z-5	Z	5	Dead	Yes	0	0	
Prune	PRDO1-Z-6	Z	6	Poor	Yes	0	5%	
Prune	PRDO1-Z-7	Z	7	Dead	Yes	0	0	
Prune	PRDO1-Z-9	Z	9	Dead	Yes	0	0	

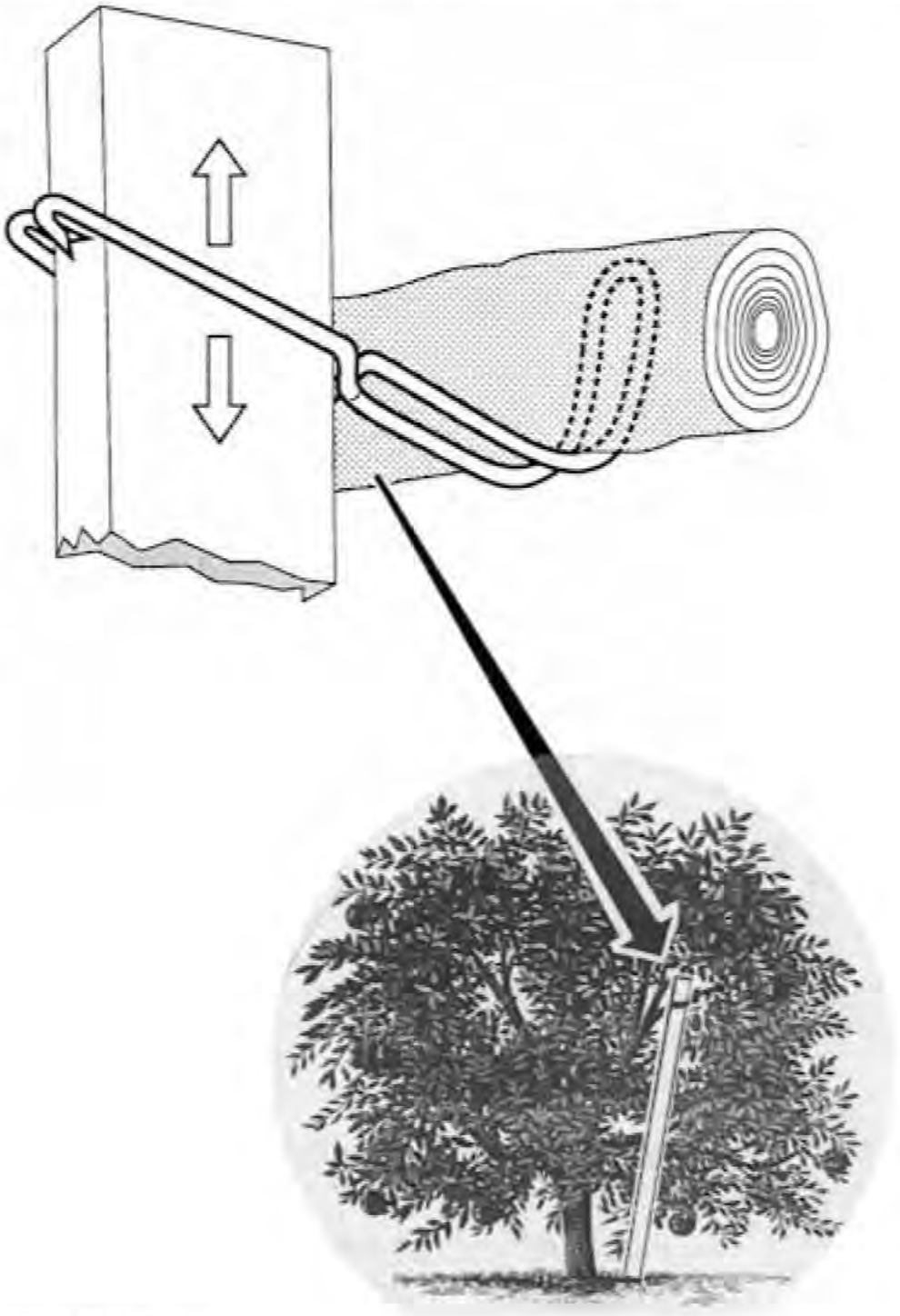
COMMERCIAL PRODUCT IDEAS
CUT SHEETS

BWP
BETTER WIRE PRODUCTS

Fruit Brute™

The Fastest and Toughest Tree Prop Clip on the Market

U.S. Patent 4,227,642



Minimizes heavy-laden limb breakage & lost investment.

Eliminates labor to notch wood stakes of varying heights.

Eliminates labor to install and remove rope & fabric slings.

Offers repeated, fully adjustable support for trees of any size.

Website design by Breeze Communications International of Western New York. (www.breezecomm.net)

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Last modified: September 08, 2001

Support Cables

Rainbow Treecare™

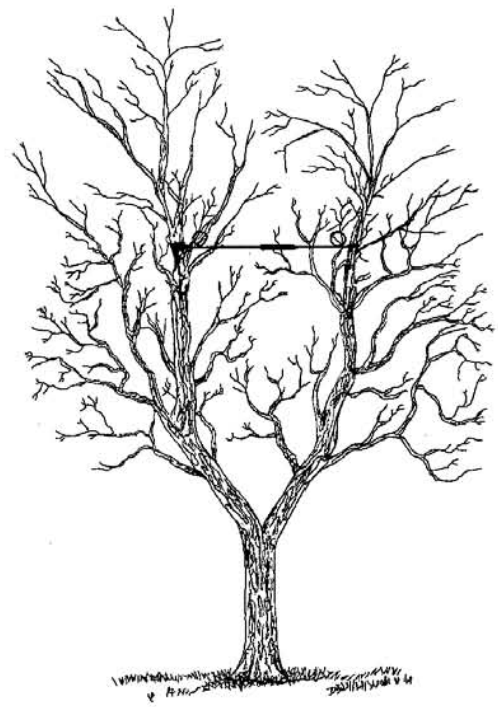
Minneapolis and St Paul
West Metro 952 922-3810
East Metro 651-251-3810
www.rainbowtreecare.com

Tree cabling involves the installation of hardware that is intended to reduce the risk of catastrophic failure. Support cables are used to reduce storm damage by limiting the lateral movement of branches and increasing the stress loads that the supported branch union can sustain.

Cables are installed in trees to provide support to weak or potentially dangerous limbs by connecting two or more limbs together. Mechanical support may be needed due to split, decayed or poorly structured limb junctions or the inherent dangers of weak-wooded trees. Poorly structured, multi-stemmed trees are more susceptible to breaking under the stress of wind or the weight of accumulated ice or snow. It is important to keep in mind that support cables have limitations. **Mechanical devices cannot be relied upon to make a potentially hazardous tree safe; once a defect is present there is always a risk of the tree failing.**

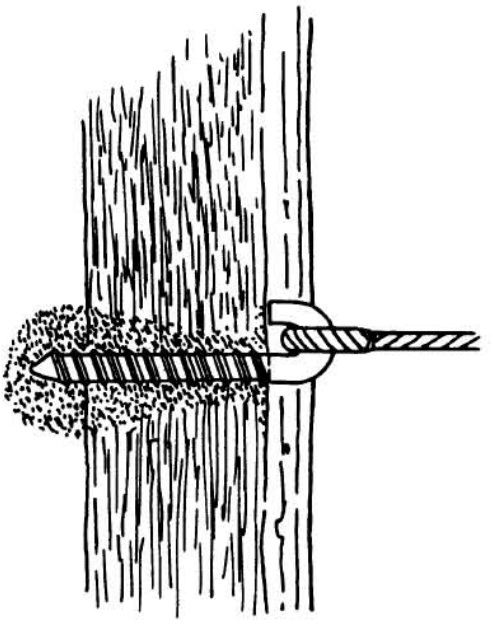
Before installing cables in a tree, the tree should be properly pruned and its structure evaluated. Hazardous and dead limbs need to be removed. The wood must be solid and large enough to support the cables. Trees that are too severely damaged should not be cabled, as a false sense of security may be created. Consideration must be given to removing the tree.

In most situations, Rainbow Treecare is now using a unique cabling system called the Cobra Cabling System." This system was invented in Germany and has only recently become available in the U.S. Cobra cables are made of a synthetic fiber that stretches to allow the tree to flex naturally. Allowing the tree to flex in a controlled manner encourages the growth of "reaction tissue" that strengthens weak areas.
Rather than drilling holes into the leads that are to be cabled, Cobra cables utilize a special padded splice loop around the leads; the loop is able to grow with the tree to avoid girdling, but grips tightly under stress. A shock absorber in the middle of the cable prevents the "whiplash effect" that occurs when rigid steel cables are shock loaded.

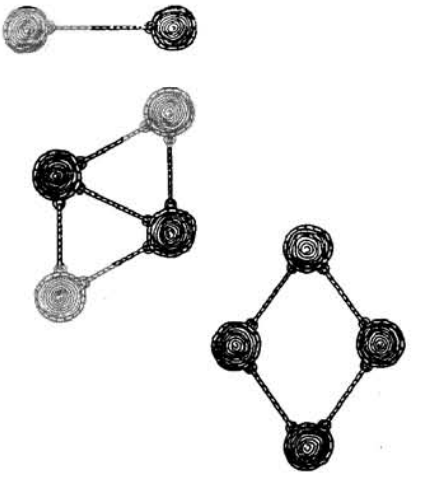


Multiple cables are often recommended to maximize strength; ideally, triangles or boxes should be formed between cabled leads. Cobra cables are providing new options in some cases where trees may have had to be removed in the past.

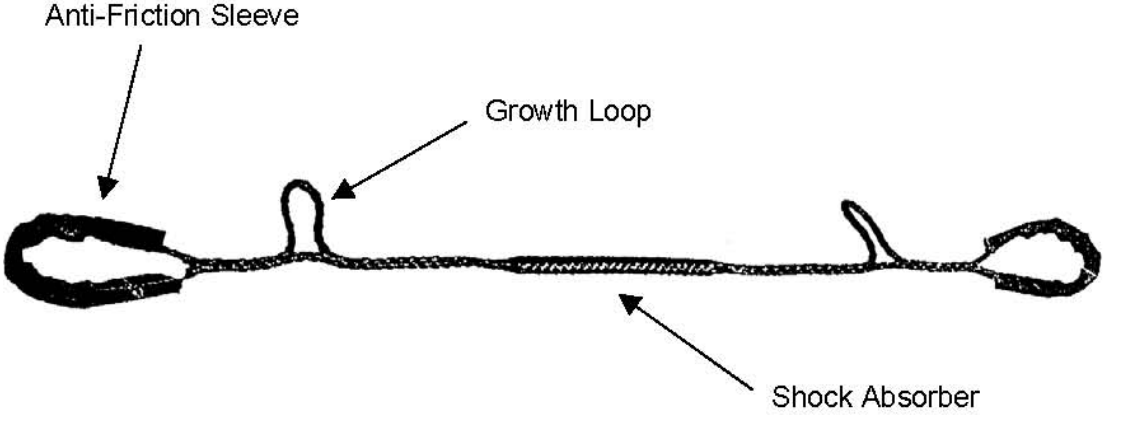
The installation of cables in a tree represents an ongoing responsibility. All hardware in trees should be inspected at least annually to ensure proper placement and make adjustments. Cobra cables should be moved up as the tree grows taller, and all of the components (other than the rope, which lasts 10-15 years) may be reused.



Decay Commonly Associated With Lag Hooks and Through-Bolts Used to Attach Steel Cables



Examples of Formations of Cables; Single, Paired Triangle, Box



Full Cobra Cable System; Note Anti-Friction Sleeve, Growth Loop, and Shock Absorber. This Support Cable System Allows Natural Flexing of Trees, Stimulating Natural Growth and Strengthening Responses.

cobra - Easy Installation In 6 Steps

1. Install expansion band	***cobra*** standard: the appropriate lenght of the insert is the circumference of stem/branch. At a distance of the branch circumference plus 20 cm (8˝) from the end of the rope compress the rope and insert the expansion insert into the rope.
2. Mount anti friction hose	Cut anti friction hose to lenght and pull over rope (lenght = minimum branch circumference) and slip over the rope and cover the expansion insert.
3. Create quick splice	Wind around the stemm, copress the rope and feed it approximately 30 cm (12") through the inside (distance 1/2 branch diameter) and out again.
4. Create compensation loop	Make a loop approximately 10 cm (4") in diameter then reinsert rope end approximately 10 cm (4") into the inside of the rope and pull it back out. This loop is for tension, to accommodate tree growth, and as control.
5. Insert shock absorber	Lubricate the tip. At a convenient spot compress the rope and insert the shock absorber into the inside of the rope through the braids. The shock absorber can be installed anywhere in the rope.
6. Build counter bearing	Cut off excess rope and install heat shrink end cap. Push end cap at least 10 cm (4") over the end of the rope. Heat the end of the rope with a blow torch until light crimping occurs. Then push end cap over the end and heat up. Repeat steps 1 - 4 at the counter bearing.

Installation height:	Optimum efficiency can be archived when installing the cabling system at 2/3 of branch height.
Field of applications:	As dynamic bracing system for stem-ø at fork up to max. 30 cm (12")

Note: Since 1993 ***cobra*** **standard** is used as dynamic bracing system worldwide. Cause of that experience we know that ***cobra*** **standard** can secure stem-ø at fork up to max. 30 cm (12"). Securing a tree with cobra means more induviduality an avoiding over-dimensioning.

Data Sheet: **cobra standard**

Patent european 623 277

1. Rope: ***cobra standard***, hollow braid 12 mm, coloured black, according to DIN 83305, 100 m rolls
(produced by a DIN EN ISO 9001:2000 certified manufacturer)

Material : Polypropylene (PP) monofil

Weight: 5.47 kg/100 m

Tensile strength: 2.080 daN both sides quick spliced (static)
(test results Germanischer Lloyd)
1.800 daN both sides quick spliced incl. shockabsorber (dynamic)
> 1.400 daN after 12 years of service life

Ductile yield: 2.5 % at 20 % breakload (420 daN)
3.5 % at 30 % breakload (625 daN)
4.5 % at 40 % breakload (830 daN)
5.5 % at 50 % breakload (1.040 daN)
7.0 % at 60 % breakload (1.250 daN)

17 % at 100 % breakload (2.080 daN)

Stiffness: 8 % at 60 % of tensile strength (1st load cycle)
7 % at 60 % of tensile strength (10th load cycle) stretch and orientation of the filaments
(test results Germanischer Lloyd)

Degradation of Tensile Strength: < 2 % per year of service life
(research papers University of Weihenstephan)

2. Expansion Insert:
Material: Polypropylene (PP)

Dimensions: Thickness: 1.2 mm, Width: 30 mm, Length: 600, 800, 1000 mm
(Cambium compatibility research paper from University of Weihenstephan)

3. Anti-Abrasion Hose:
Material: Polypropylene (PP) textile webbing tube

Dimensions: Width: 60 mm x 25 m rolls

Recycling: Pos. 1, 2 and 3 can be melted together

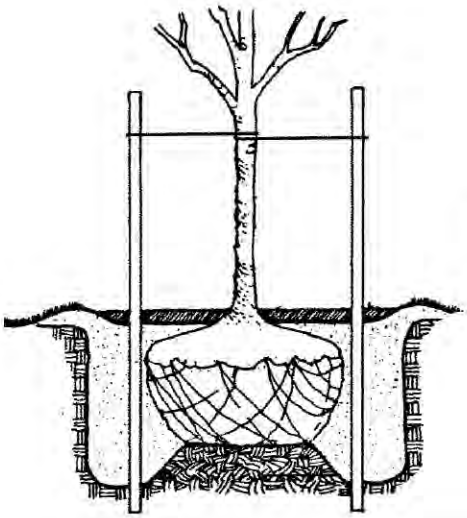
4. Shock Absorber:
Material: EPDM, special rubber with specified density

Dimensions: Diameter: 24 mm, Length: 400 mm
max. extension in rope under load 200 mm

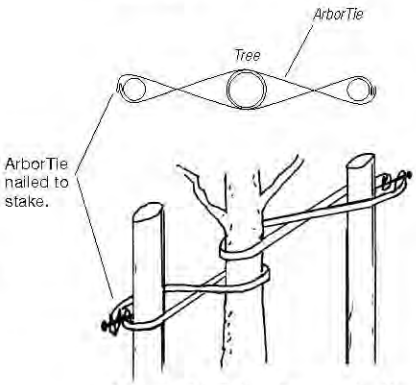
Manufacturer:
of the cobra system
pbs, Gerokstaffel 1, 70184 Stuttgart
Tel. +49-711-235661, Fax: +49-711-235662
Internet: www.cobranet.de, e-mail: pbs@cobranet.de

DeepRoot ArborTie®– Uses and Specifications

Typical staking using ArborTie®

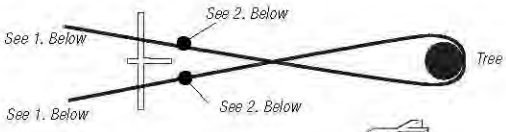


Staking Detail

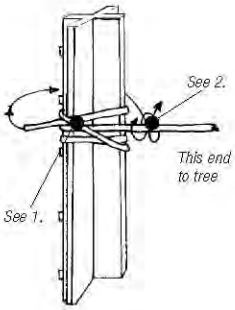


Fold ends of ArborTie back. Secure to stake with 1" galvanized roofing nail or use a knot.

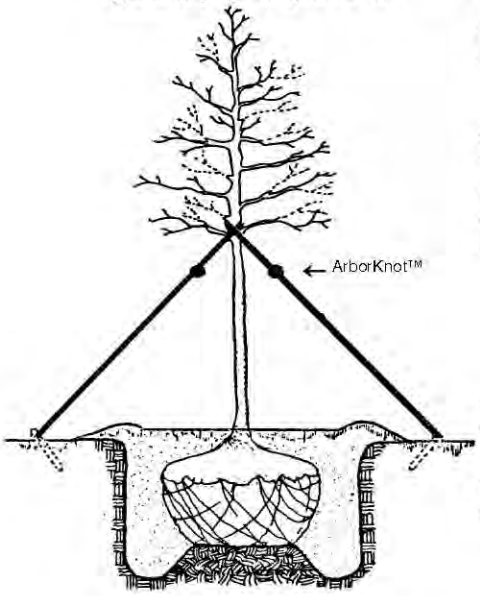
"T" Stake Detail



1. Each end should be tied around the "T" Stake with a rolling hitch.
2. The ends then should be tied off with a second hitch on the ArborTie that leads to the tree.



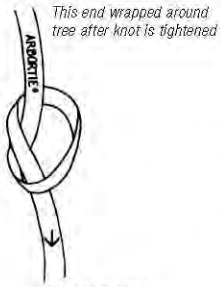
Typical guying using ArborTie®



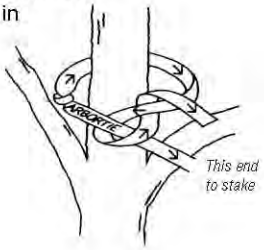
ArborKnot™ Instructions

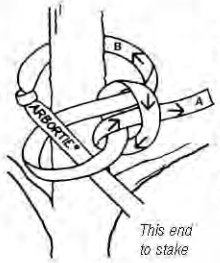
The ArborKnot™ is a unique knot for guying which expands to allow for girdle free growth.

Step 1
Tie a simple knot 18"-24" (depending on the diameter of tree) from either end of the ArborTie.



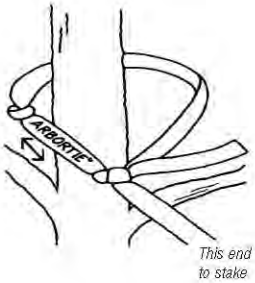
Step 2
Wrap this end around tree. Begin a new knot below the knot that was tied in Step 1.

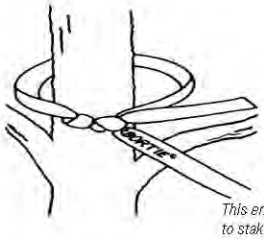




Step 3
Follow motion of ArborTie as shown, finishing the knot by pulling tightly on points A and B at the same time.

Step 4
Slide knot just completed up to the knot tied in Step 1. Fasten free end to stake or anchor.





Step 5
The ArborKnot provides secure, girdle free attachment of the ArborTie to tree.

Specified ArborTie® green (or white) staking and guying material is to be flat woven polypropylene material.

3/4" wide. 900 lb. break strength.

ArborTie shall be fastened to stakes in a manner which permits tree movement and supports the tree.

Helping Trees Live In The Urban Environment

ArborTie®

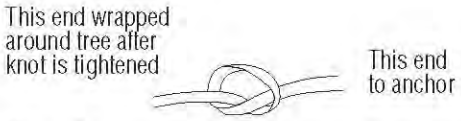
Deep Root Partners, L.P.
81 Langton Street, Suite 4, San Francisco, CA 94103
Tel: 415 437 9700 or 800 ILV ROOT (458.7668) Fax: 415 437 9744 or 800 277 ROOT (277.7668)
www.deeproot.com

DeepRoot®
URBAN LANDSCAPE PRODUCTS

Easy installation-faster and easier than traditional tree anchoring kits

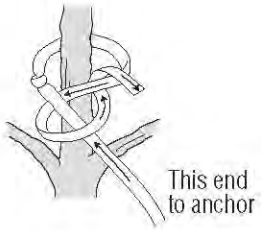
ArborTie® is a revolutionary material for staking and guying trees. Specifically designed to replace traditional methods such as wire and hose, ArborTie® is safe, soft, easy to use and less expensive than traditional tree ties.

A Attach ArborTie® to tree using the ArborKnot® method:

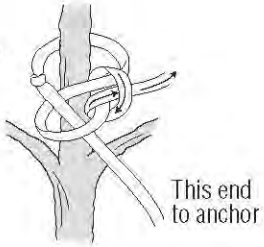


Step 1
Tie a simple knot 18" to 24" (depending on the diameter of the tree) from either end of the ArborTie®.

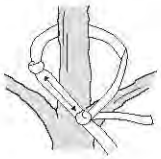
Step 2
Wrap this end around tree. Begin the above knot below the knot that was tied in Step 1.



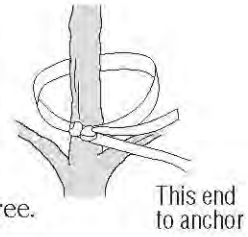
Step 3
Follow motion of ArborTie® above, finishing the knot by pulling tightly on points A and B at the same time.



Step 4
Slide knot just completed up to the knot tied in Step 1. Fasten free end to anchor.



Step 5
The ArborKnot® provides secure, girdle free attachment of ArborTie® to tree.

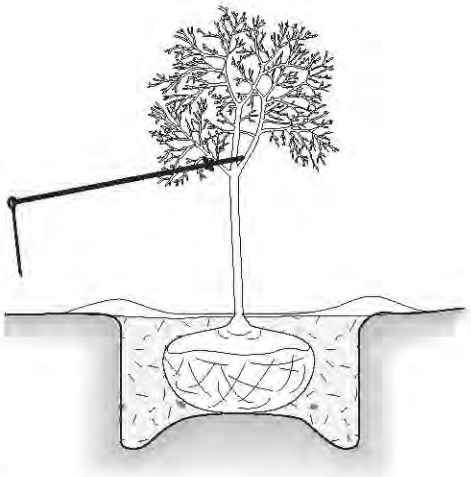


B

Secure long end of ArborTie® to eye of the anchor.

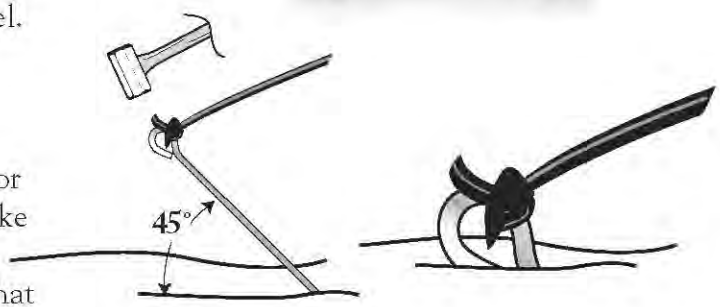
C

Anchor should be outside of planting hole and driven into the undisturbed soil until the ArborTie® is taut. Add tension to the ArborTie® by driving the anchor into the ground at a 45 degree angle to the tree trunk. Anchor eye should be just even to soil level.



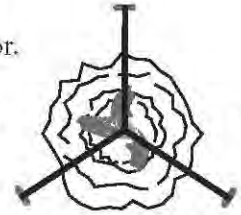
D

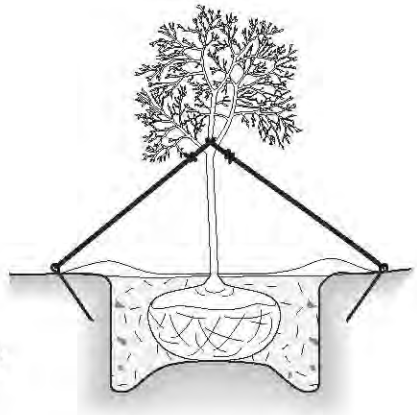
When driving anchor into the ground, make sure eye is left at proper depth so that the opening is buried.



E

Repeat steps A-D for each remaining anchor. Anchors should be evenly spaced around tree base.





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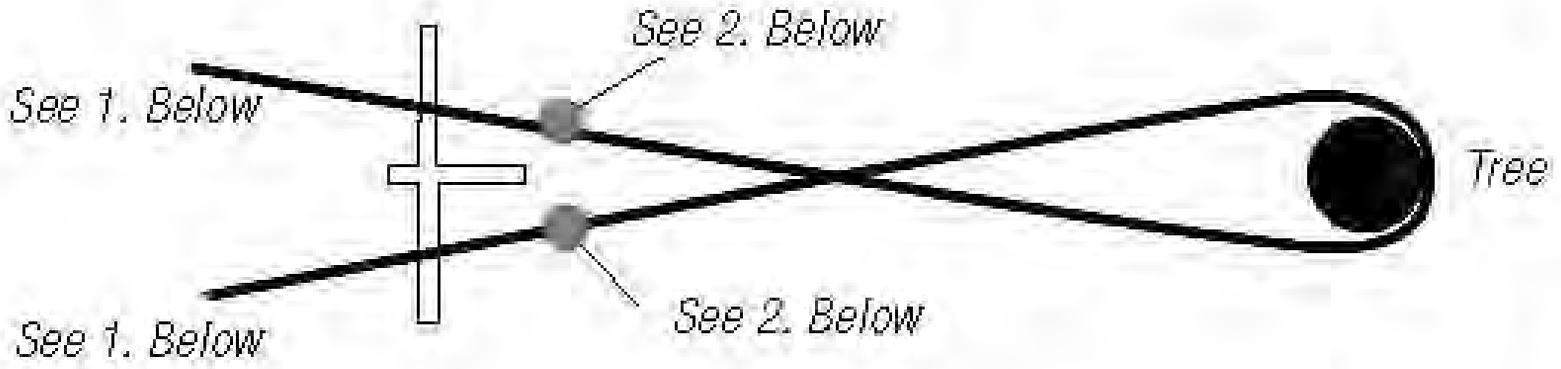
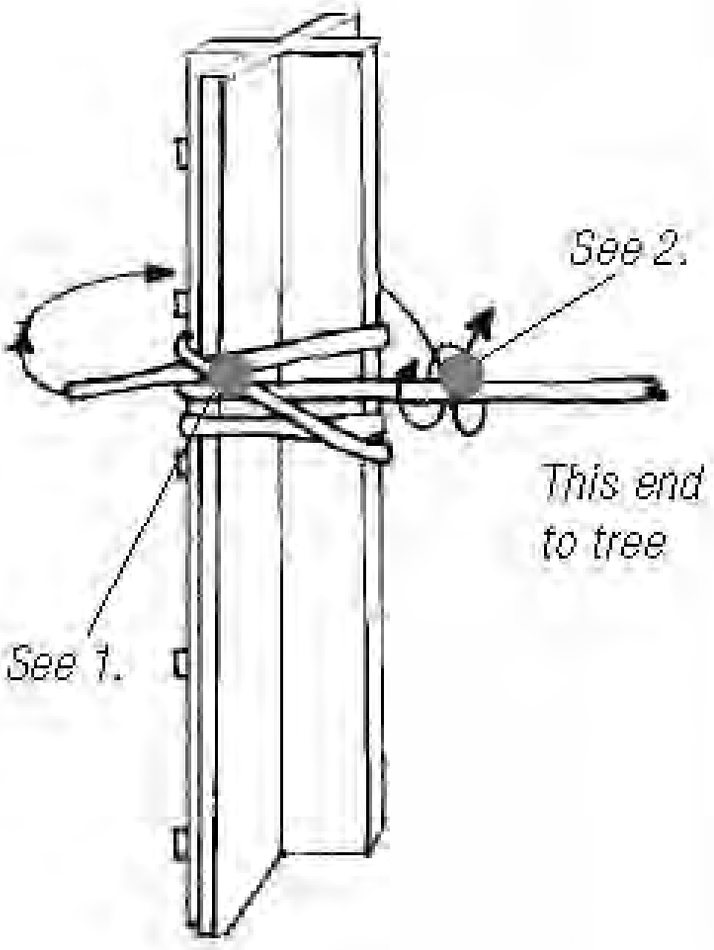
"T" Stake Detail



1. Each end should be tied around the "T" Stake with a rolling hitch.
2. The ends then should be tied off with a second hitch on the ArborTie that leads to the tree.



treegator.com
slow release watering bags for trees

directions for use

Filling up a Treegator® Original is fast & easy.
See below for complete instructions.

TREEGATOR® ORIGINAL

Step-by-step filling instructions

Step 1:

- Use on any tree/shrub with branches beginning at least 30" off the ground or higher
  > For low-branch trees or large shrubs, use a 14 gallon Treegator® Junior
- Place back of bag against trunk, with zippers on the uphill side of tree
  > Be sure to clear all sharp objects from area to be watered
- Wrap both sides around trunk until zippers meet
  > Single unit fits 1" to 4" diameter/caliper trees
  > Two units zipped together back-to-back = 50 gal. setup (fits 5" to 8" caliper trees
- Zip both sides of bag together from bottom to top

Step 2:

- Lift up tag at top of bag to expose fill opening
- Insert water hose (up to 3" dia.), into fill opening
- Turn on water supply and begin filling with water.
  > Use clean water - If necessary, filter water through cotton cloth on hose end
  > Bag must be filled at tree - Do not attempt to move/transport bag when full
- IMPORTANT: Fill bag to approx. 1/4 capacity, then proceed to Step 3

Step 3:

- After bag is 1/4 full...
  > Gently lift up on black straps at top of bag to expand bottom
  - If desired, add pre-mixed water soluble fertilizer.
  > To prevent clogging, premix fertilizer in separate container
  (not necessary with dissolvable fertilizer packets)

Step 4:

- Fill to desired level and let bag empty.
  - > Single bag = Maximum capacity approx. 20 gallons of water (shown @ left)
  - > Two bags = Maximum capacity approx. 50 gallons of water
  - > Treegator® Original Bag(s) will be empty in approx 5 to 9 hours
- For newly planted trees, start with an initial fill schedule of 1 to 2 times per week

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How much water does a newly planted tree require per week?

For newly planted trees, the Univ. of Georgia College of Agriculture and Envionmental Sciences Cooperative Extension Service recommends using this formula:

> ***Two (2) gallons of water per foot of tree height weekly.***
> *This means that if you plant a 15 foot tall tree, you should water it with 30 gallons of water per week.*

- ***For 20 gal. Treegator® Original applications, this translates into a fill schedule of once per week.***

Note: Proper watering frequency can vary depending on several factors (tree and soil type, weather, etc.) This recommendation will NOT guarantee that your tree is being watered properly - Use it only as a guide. Consult a local gardening or tree care professional for more information on proper watering practices for your particular tree type and region.

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slow release watering bags for trees

answers to f.a.q.'s

Get answers to your questions here.
Don't see your question? Contact us!

FREQUENTLY ASKED QUESTIONS

Click on a question below to view answers.

20 GAL. TREEGATOR ORIGINAL QUESTIONS	14 GAL. TREEGATOR JUNIOR QUESTIONS
1 • What is a 20 gal. Treegator® made of?	1 • What is a 14 gal. Treegator® Jr. made of?
2 • How long does it take for a 20 gal. Treegator® to empty?	2 • How long does it take for a 14 gal. Treegator® Jr. to empty?
3 • If necessary, can I adjust the drip time on a 20 gal. Treegator®?	3 • If necessary, can I adjust the drip time on a 14 gal. Treegator® Jr.?
4 • Where are the drip holes located on a 20 gal. Treegator®?	4 • Where are the emitter valves located on a 14 gal. Treegator® Jr.?
5 • What is the maximum size (dia.) tree trunk that a single 20 gal. Treegator® will fit around?	5 • What is the maximum size (dia.) tree trunk that a 14 gal. Treegator® Jr. will fit around?
6 • Can I use a 20 gal. Treegator® on a tree larger than 4" in diameter?	6 • Can I use a 20 gal. Treegator® on a tree larger than 4" in diameter?
7 • Will a 20 gal. Treegator® degrade over time due to exposure to UV rays?	7 • Will a 14 gal. Treegator® Jr. degrade over time due to exposure to UV rays?
8 • About how long does it typically take to fill up a single 20 gal. Treegator®?	8 • About how long does it typically take to fill up a 14 gal. Treegator® Jr.?
9 • Is there a minimum size (diameter) tree that I can use a 20 gal. Treegator® on?	9 • Is there a minimum size (diameter) tree that I can use a 14 gal. Treegator® Jr. on?

10 • If an empty 20 gal. Treegator® is left on for an extended period of time, will it hurt the tree?	10 • If an empty 14 gal. Treegator® Jr. is left on a tree for an extended period of time, will it hurt the tree?
11 • Can liquid fertilizers/biostimulants be added to a 20 gal. Treegator®?	11 • Can liquid fertilizers/biostimulants be added to a 14 gal. Treegator® Jr.?
12 • Can a 20 gal. Treegator® be used on a tree that is on a hill or steep grade?	12 • Can a 14 gal. Treegator® Jr. be used on a tree that is on a hill or steep grade?
13 • Does a 20 gal. Treegator® come with a manufacturer's warranty?	13 • Does a 14 gal. Treegator® Jr. come with a manufacturer's warranty?
14 • Can I use a 20 gal. Treegator® on a tree with branches lower than 25" off the ground?	14 • Can I use a 14 gal. Treegator® Jr. on a tree with branches lower than 25" off the ground?
15 • Is there any run-off of water when using a 20 gal. Treegator®?	15 • Is there any run-off of water when using a 14 gal. Treegator® Jr.?
16 • Can a hose larger than 1.5" (standard garden hose) in diameter be used to fill up a 20 gal. Treegator®?	16 • What size hose can I use to fill up a 14 gal. Treegator® Jr.?
17 • Can a 20 gal. Treegator® be unclogged if it doesn't empty properly?	17 • Can a 14 gal. Treegator® Jr. be unclogged if it doesn't empty properly?
18 • How often should I fill up a 20 gal. Treegator® to ensure proper watering?	18 • How often should I fill up a 14 gal. Treegator® Jr. to ensure proper watering?

20 GAL. TREEGATOR ORIGINAL ANSWERS | **14 GAL. TREEGATOR JUNIOR ANSWERS**

1 • A 20 gal. Treegator® Original is made of green polyethylene plastic with reinforced cording for added durability against tears and rips. Other materials used on the bag are black polypro straps, heavy duty green nylon zippers that are sewn with tough wax-coated thread.

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1 • A 14 gal. Treegator® Junior is made of brown, UV protected PVC that is heat sealed together on all sides. The red fill valve and two emitters are also made of PVC, and are attached to the bag with 1/4" heat seals.

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2 • The time it takes for a 20 gal. Treegator® Original to empty is approx. 5 to 9 hours. This may vary slightly depending on weather conditions, soil & tree types, etc.

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2 • The time it takes for a 14 gal. Treegator® Junior to empty is approx. 4 to 8 hours. This may vary slightly depending on weather conditions, soil & tree types, etc.

Return To Top

3 • The time it takes for a 20 gal. Treegator® Original to empty is approx. 5 to 9 hours. This may vary slightly depending on weather conditions, soil & tree types, etc.

Return To Top

3 • The time it takes for a 14 gal. Treegator® Junior to empty is approx. 4 to 8 hours. This may vary slightly depending on weather conditions, soil & tree types, etc.

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4 • On a 20 gal. Treegator® Original, the water release holes are located on the bottom corners on the front of the bag. (Sometimes, the holes can be tucked behind the folded pouch)

On the reverse side of the bag are the optional drip hole locations that have been closed by covering them with two pieces of waterproof vinyl tape.

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4 • On a 14 gal. Treegator® Junior, the emitter valves are located on the underside of the bag. (red fill valve down)

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5 • The max. size trunk that one 20 gal. Treegator® Original will fit around is 4" in dia. (caliper).

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5 • The maximum size tree trunk that a 14 gal. Treegator® Junior will fit around is 4 inches in diameter (caliper).

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6 • Yes. For trees 5 to 8" in diameter, use two 20 gal. Treegator® Originals zipped back-to-back. This is a 50 gal. setup. (shown at left).

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6 • No. The maximum size tree trunk that a 14 gal. Treegator® Junior will fit around is 4 inches in diameter (caliper).

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7 • A 20 gal. Treegator® Original is guaranteed not to break down or degrade due to extended UV exposure for at least 2 years from the date of purchase. Treegator® is made with a polyethylene material coated with U.V. inhibitors that block the suns harming rays.

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7 • A 14 gal. Treegator® Junior is guaranteed not to break down or degrade due to UV exposure for at least 2 years from the date of purchase. Treegator® Junior is made of a tough PVC coated with UV inhibitors.

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8 • It takes approximately 2 to 5 mins. to fill up a 20 gal. Treegator® Original with water.

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8 • It typically takes approx. 2 to 5 mins. to fill a 14 gal. Treegator® Junior with water.

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9 • A 20 gal. Treegator® Original cannot be used on a tree with a trunk diameter less than one inch. The bag uses the trunk a slight bit for support.

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9 • There is no minimum trunk size that is recommended in order to use a 14 gal. Treegator® Junior.

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10 • Treegator® is not designed to be a permanent installation; However, if a 20 gal. Treegator® Original is left on a tree for an extended period of time, it should not harm the tree. A 20 gal. Treegator® Original creates shade around the trunk and root area, which can cause insects to inhabit the shaded area. Unless the bug is a wood boring insect, there will be no harm done to the tree.

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10 • Treegator® is not designed to be a permanent installation; However, if a 14 gal. Treegator® Junior is left on a tree for an extended period of time, it should not harm the tree. A 14 gal. Treegator® Junior creates shade around the trunk and root area, which could cause insects to inhabit the shaded area. Unless the bug is a wood boring insect, there will be no harm done to the tree.

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11 • Yes. Liquid fertilizers and/or water soluble fertilizers can be added to a 20 gal. Treegator® Original. However, they must be pre-mixed in a separate container before they are added to the bag. Please be sure that the chemicals are dissolved as much as possible before adding them to the bag (no sludge!) - This will help prevent against clogging. We recommend that the mixture be added after the bag is at least 1/4 full.
NOTE: This is not necessary with dissolvable fertilizer packets.

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11 • Yes. Liquid fertilizers and/or water soluble fertilizers can be added to a 14 gal. Treegator® Junior. However, they must be pre-mixed in a separate container before they are added to the bag. Please be sure that the chemicals are dissolved as much as possible before adding them to the bag (no sludge!) - This will help prevent against clogging. We recommend that the mixture be added after the bag is at least 1/4 full.
NOTE: This is not necessary with dissolvable fertilizer packets.

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12 • Yes. A 20 gallon Treegator® Original can be used on a hillside or steep grade. However, the bag must be positioned with the zippers on the uphill side of the tree trunk, with the front of the bag facing downhill. This will allow the bag to drip properly.

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12 • A 14 gal. Treegator® Junior cannot be used on a hill or a steep grade. Due to the placement of the emitters, a 14 gal. Treegator® Junior must be used on a level surface, or on top of a properly built mulch cup.

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13 • Every 20 gal. Treegator® Original comes with a 2-year manufacturer's warranty from the date of purchase against defects in materials and workmanship.

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13 • Every 14 gal. Treegator® Junior comes with a 1-year manufacturer's warranty against defects in materials and workmanship.

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14 • No. A 20 gal. Treegator® Original will not fit underneath a tree with branches lower than 25" to 30" off the ground. A 20 gal. Treegator® Original has a vertical cone-shape that stands approximately 26" to 30" high when filled with water.

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15 • Little to no run-off. A 20 gal. Treegator® Original typically provides 100% water absorption with every use.

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16 • A 20 gal. Treegator® can accommodate a hose larger than a standard garden hose of 1.5" diameter. In fact, a 20 gal. Treegator® will fit up to a 3" diameter hose;perfect for crews that may use large hoses when working with watering trucks and/ or large tanks with or without pumps.

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17 • Yes. A 20 gal. Treegator® Original can be unclogged if it is not releasing water properly.

Before unclogging a Treegator®, be aware of where the water release holes are located. When full, release holes are located underneath each corner of bag . Check to see if they are clogged by gently lifting up each corner until you can see the water release hole locations. (See right)

If one or both holes are clogged, follow procedure shown below.

14 • Yes. A 14 gal. Treegator® Junior is designed to be used on trees with branches at least 6" above the ground or higher.

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15 • Little to no run-off. A 14 gal. Treegator® Junior typically provides 100% water absorption with every use.

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16 • Every 14 gal. Treegator® Junior is fitted with a fill valve that can accommodate a standard sized garden hose of approx. 1.5" in diameter.

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17 • Yes - A 14 gal. Treegator® Junior can be unclogged if it is not releasing water properly.

Before attempting to unclog the emitter valves, be sure that the product is being used on a level surface. Using a 14 gal. Treegator® Junior on a sloped surface can cause water to remain in the bag.

If this is not the cause of improper water release rates, follow procedure shown below.

Sometimes, you may just need to clear off mud or debris that has built up around the hole. Simply wipe away any dirt, mud or sediment that may be covering either or both of the water release holes.

Clogged water release hole

Cleared water release hole

Other times, you may need to remove the bag to unclog it; Especially in cases where dirty/unfiltered water has caused a clog from the inside of the bag due to settling of sediment.

After the bag has been emptied, flatten it out on a level surface as best as possible. Fill it with clean or filtered water and shake the bag to loosen any particles - Empty any dirty water by turning the bag upside-down, allowing the water to exit via the fill opening.

Finally, place bag on tree trunk, zip up, and fill with clean water. If clogging problems still persist, make sure that the watering area around the trunk is clear of fine sediment that could enter water release holes. Also, be sure that the bags are filled according to our step-by-step directions to ensure that proper procedure is being followed when filling bags. If the bags still become clogged, please E-mail Spectrum Products, Inc. for additional assistance.

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To locate the emitter valves, carefully empty the bag by tipping the bag towards the red fill valve. After all the water has been emptied, flip the bag over (red fill valve facing down) to view the emitters. (see right)

Placement of emitters

To unclog the emitter valves, pull and twist on the end of the emitter inserts. (see right) After the emitter inserts have been removed, fill the bag with a small amount of clean water, and allow it to run out of the open valves. Thoroughly flush emitter inserts with clean water, and then push back into fill valves - be sure the inserts are replaced tightly.

Removal of inserts

Flip the bag back over (red fill valve face up) place around tree trunk, fill to desired level and let it empty. If clogging continues, repeat procedure, or E-mail us for additional help.

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18 • For newly planted trees, the Univ. of Georgia College of Agriculture and Environ. Sciences Coop. Ext. Service recommends using this formula:

> 2 (two) gallons of water per foot of tree height weekly.

This means that if you plant a 15 foot tall tree, you should water it with 30 gallons of water per week.

For 20 gal. Treegator® Original applications, this translates into a fill schedule of once per week.*

However, if you are experiencing abnormally dry weather conditions, or if the tree is showing signs of drought or transplant shock (wilting or browning of leaves); Increase your fill schedule accordingly.

*Please Note:
Proper watering frequency can vary depending on several factors (tree and soil type, weather, etc.) This recommendation will not guarantee that your tree is being watered properly - Use it only as a guideline.

Consult a local gardening or tree care professional for more information on proper watering practices for your particular tree type and region.

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18 • For newly planted trees, the Univ. of Georgia College of Agriculture and Environ. Sciences Coop. Ext. Service recommends using this formula:

> 2 (two) gallons of water per foot of tree height weekly.

This means that if you plant a 15 foot tall tree, you should water it with 30 gallons of water per week.

For 14 gal. Treegator® Junior applications, this translates into a fill schedule of twice per week.*

However, if you are experiencing abnormally dry weather conditions, or if the tree is showing signs of drought or transplant shock (wilting or browning of leaves); Increase your fill schedule accordingly.

*Please Note:
Proper watering frequency can vary depending on several factors (tree and soil type, weather, etc.) This recommendation will not guarantee that your tree is being watered properly - Use it only as a guideline.

Consult a local gardening or tree care professional for more information on proper watering practices for your particular tree type and region.

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Retail Products
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TREE RINGS

Portable, Slow-Drip Water Delivery System

**Efficient, Effective, Portable Slow-Drip Irrigation.
Get thorough water penetration to the roots, with
NO RUNOFF, with Tree Rings.**

Compact... Nest for easy storage & transportation

Delivers Every Valuable Drop of Water Where it Counts!

- More targeted and effective than sprinkler systems
- More water-efficient than rain or irrigation
- Eliminates guess work in watering
- Reduces watering frequency
- Plant targeted, Eliminates runoff
- Facilitates 90% moisture absorption
- 100% deep soil penetration

TREE RING
25 Gallon Capacity

TREE RING JR
10 Gallon Capacity

For newly transplanted trees, drip Bio-Plex Transplant Concentrate to guarantee survival.

Specs... TREE RING (Regular)
Capacity - 25 Gallons • Drip Time - 3-4 hrs
- Max. Tree Diameter - 10", Height 10"
- Construction - HDPE/UV Resistant
- Color - Black
- Weight - 7 lb. Each
- Life Expectancy - 3-10 years

(Estimated 1000-5000 Uses Plus)

Specs... TREE RING JR
Capacity - 10 Gallons • Drip Time - 2-3 hrs
- Max. Tree Diameter - 4", Height 8"
- Construction - HDPE/UV Resistant
- Color - Black
- Weight - 3 lb. Each

"Without Tree Rings our extensive tree and shrub installations last year would not have been nearly as successful, especially considering the drought and water restrictions." ...Harrisburg North G.C.

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Pick Up Truck Tanks

See list below. Due to our website upgrade, we request you please call 866 310 2556 so we may be of complete service to you.

Pick Up Tanks are selected as applicator tanks or when transportable (non-D.O.T. regulated) containment is required. Tanks are designed to fit most full-size pickup trucks. Tanks are manufactured from medium-density polyethylene with U. V. inhibitors and designed for containment of liquids of up to 1.7 specific gravity. Tank walls are translucent for level viewing and equipped with gallon indicators.

Name	Capacity	Size	Part Number
Click here for price!	195 Gallons	38"L x 61"W x 30"H	RPU195
(2) 195gallon tanks (SAVE BIG)	(2) 195 gallons	38"L x 61"W x 30"H	DOUBLERPU195
Sale 200 gallons Click Here!	200 gallons	52"dia x 30"H	DH200PU
Great Buy 210 gallon Click Here!	210 gallons	60"dia x 29"H	NW210PU
Click here for price!	295 Gallons	60"L x 61"W x 30"H	RPU295
305 Gallon Low Profile Click Here!	305 gallons	60"L x 58"W x 30"H	DH305PU
Great Buy 325 gallon Click Here!	325 gallons	62"dia x 33H	NW325PU
Sale 350 gallons Click Here!	350 gallons	62"dia x 34"H	DU350PU
Great Buy 425 gallon Click Here!	425 gallons	65"dia x 39"H	NW425PU
Sale 450 gallons Click Here!	450 gallons	62"dia x 41"H	DH450PU
Click here for price!	475 Gallons	65"L x 65"W x 46"H	RPU475

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- Fresh Water Tanks*click here*
- Black/Grey Water Tanks*click here*

Below Ground Tanks
- Septic (Waste) Tanks
- Cistern (Water) Tanks

Above Ground Tanks
- Rectangular Plastic Tanks
- Vertical Storage & Water Tanks
- Low Profile Water Hauling Tanks
- OIL TANKS (Used Oil Only)
- Horizontal & Elliptical Leg Tanks
- Elliptical & Horizontal "Cradle" Tanks
- Drainable Leg Tanks (Fully Draining!!!)
- Cone Bottom Tanks & Stands (Biodiesel Production)
- Double Wall Storage Tanks
- Containment Basins
- Containment Trays
- Drum Spill Pallets & Containment
- FUEL TANKS (Be Prepared!!)
- Pick Up Truck Tanks
- ***PRESSURE WASHER TANKS*** (auto detail industry)
- Doorway Tanks (29" wide)
- Small Sprayer Tanks
- Loaf Tanks (all-purpose)
- Green Stock Tubs
- Flat Bottom Utility Tanks
- Open Top Tanks **PE & PP** (Chemical Plating Tanks)
- Brine Tanks

Above Ground Tanks

Low Profile Water Hauling Tanks

See list below. Due to our website upgrade we ask that you please call 866 310 2556 with your request so we may fully service your needs.

Our sizes range up to 2500 gallons on the low profile box type water hauling tanks.

The low profile design of the 2500 gallon tank makes it ideal for use on trailers or in the back of a truck. The slosh reduction ribs provide excellent structural support. It can also be used as a stationary water storage tank.

The 1250 and 1500 low profile tanks may be used for storage or transport. They are an excellent choice when height limitations are a factor and are the perfect height for putting under your cottage or cabin.

Name	Capacity	Size	Part Number
1250 Gallon Low Profile Click Here!	1250 gallons	130"L x 81"W x 38"H	NW1250LP
1500 Gallon Low Profile Click Here!	1500 gallons	130"L x 81"W x 44"H	NW1500LP
2400 Gallon Low Profile Click Here!	2400 gallons	150"L x 90"W x 53"H	NW2400HZB

BUSH HOG® 278 Series Rotary Cutters

FEATURES:

- Ideal for medium duty work in pastures or orchards
- 8 foot cutting width
- 9 gauge deck construction

SPECIFICATIONS	
Model	**278**
Cutting Width	8 feet
Transport Width	101 inches
Cutting Height	2-1/2 to 10 inches (lift), 2-1/2 to 12 inches (pull)
Hitch	3-point Category II, Category II quick hitch or pull
Cutting Capacity	Up to 2-inch diameter
Input Driveshaft	ASAE Category 4
Constant Velocity Driveshaft	Standard on pull models
Gearbox Horsepower	Main - 70, outboard - 50
Slip Clutch	Regular duty slip clutch available
Blades	1/2 x 4 inches, uplift
Blade Holder	Round
Blade Tip Speed	16,856 fpm
Wheels	Laminated
Deck Thickness	9 gauge
Side Bands	9 gauge x 7-3/8 inches
Deflectors	Front belting and rear bands
Recommended Tractor HP	40 - pull models, 55 - lift models
Offset	78-1/2 inches
Transfer	Rubber element cross shaft
Options	Hyd. adj. for pull models, jackstand, ratchet (for pull models), highway chains, dual tailwheels available

For Pricing and Availability, Contact an Authorized Bush Hog Dealer

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The St George Company

unique and innovative equipment to make your work safer and easier

seppi m_ SMO ORCHARD & VINEYARD MULCHING MOWER

The Original Flail Hammer Mower

Mows grass and shreds prunings up to 4" in diameter. By closing the adjustable rear gate you can shred pruned branches up to 4" in diameter; and by opening it you can mow the highest grass swiftly using 25% less horsepower.

Pictured with optional sidecutter

Optional Swing Arm Sidecutter

Adjustable Rear Gate; open for grass mowing, closed for muching

For SMO mower only. This optional sidecutter allows you to mow the grass right up to and around the tree. Can be easily attached to mower and is belt driven. Adds two feet to your cut.

Pictured with 70cm parallel sideshift

Hydraulic Sideshift; cylinder and hose kit.(opt.)

Optional Front Mount Kit

Features:

- Optional swing arm sidecutter adds 24" (61cm) cut to mower for around trees, fence posts, etc.
- Optional brush sweeper throws both large and small branches under the mower for mulching.
- Standard parallel sideshift; the machine can be moved up to 31" (70cm) from center to right and back.
- Large 8 bolt bearing support with self aligning dual carriage roller bearing.
- Optional hydraulic cylinder available for sideshift.
- Max. 85 HP gearbox with built-in overrunning clutch.
- With rear gate completely open, speeds up to 6 MPH for cutting grass can be reached.
- Flail hammers are heavy-duty, drop forged steel - not cast.
- Stationary cutter bars on the underside of the mower assist in shredding of material.

Hammer Shaft; showing forged hammer flails

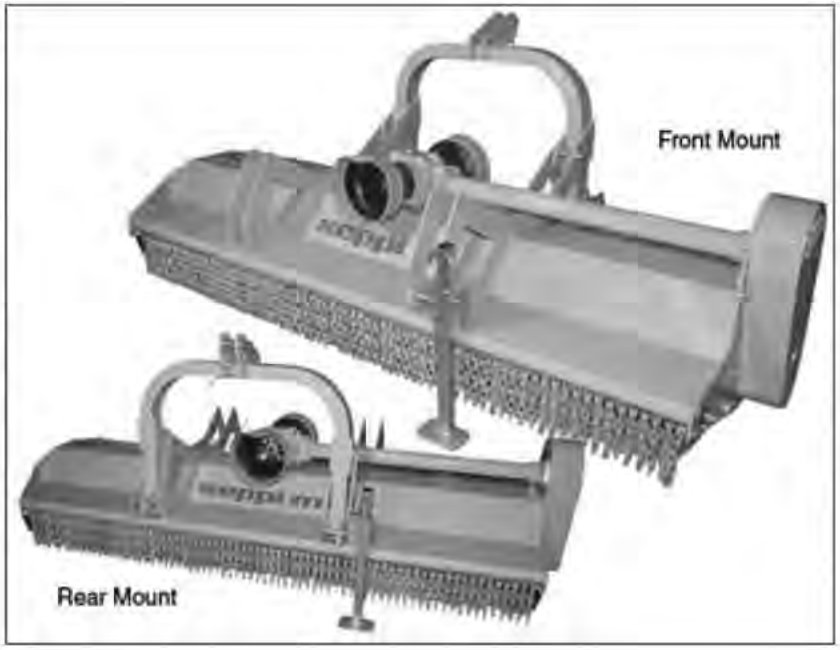
MODEL	CUTTING WIDTH	NO. OF HAMMERS	HORSEPOWER	WEIGHT kg / LB
SMO150	150 cm / 59 in	15	30	435 / 957
SMO 175	175 cm / 69 in	18	36	475 / 1045
SMO 200	200 cm / 79 in	21	45	510 / 1122
SMO 225	225 cm / 89 in	21	50	560 / 1232
SMO 250	250 cm / 98 in	24	57	645 / 1419

seppi m_ SMO - reverse-centre-fixed MULCHING MOWER

Identical machine to the standard SMO above, yet is has front / rear mount capability as standard equipment.

Optional rubber wheels instead of roller

SMO-fh similar machine with added linear hydraulic side-shift.



The Seppi SMO mower does an excellent job of mulching the male plants in our hybrid canola seed production fields. This minimizes problems with regrowth and eliminates the risk of picking up any of the male seed when swathing. It should also reduce the volunteer canola problems the following year.

Will Van Roessel
Specialty Seeds Ltd.
Bow Island, AB

MODEL	CUTTING WIDTH	NO. OF HAMMERS	HORSEPOWER	WEIGHT kg / LB
SMO-rev-c-f 150	150 cm / 59 in	15	40 min. 78 max.	449 / 990
SMO-rev-c-f 175	175 cm / 69 in	18	40 min. 78 max.	516 / 1137
SMO-rev-c-f 200	200 cm / 79 in	21	48 min. 78 max.	562 / 1239
SMO-rev-c-f 225	225 cm / 89 in	21	48 min. 78 max.	608 / 1340
SMO-rev-c-f 250	250 cm / 98 in	24	55 min. 78 max.	667 / 1470

seppi m_ SMWA Multipla / OLS Multipla

SMWA Multipla / OLS Multipla Wide mower for large surfaces such as airports, golf courses and parks.

- Mulches grass and branches up to 8 cm [3 inch] in diameter
- Suitable for tractors from 73 to 125 kW (100 - 170 HP).
- Trailed.
- Hydraulic folding with safety locking bars for road transportation
- Adjustable cutting width and head angling.
- Floating Heads to follow the contour of the soil.
- 1000 rpm gearbox with freewheel.
- Adjustable cutting height on bord from. Full with rear rollers.
- Adjustable rear hood to adjust the degree of mulching.
- Rotor with hammers.
- Remote electric control on bord of the tractor Optional with joystick.

MODEL	CUTTING WIDTH	NO. OF HAMMERS	HORSEPOWER	WEIGHT
OLS-MUL600	600 cm / 236 in	63	Min 100 Max 170	3455 kg / 7601 lbs
OLS-MUL650	650 cm / 256 in	72	Min 100 Max 170	3731 kg / 8208 lbs
SMWA-MUL500	500 cm / 176 in	105	Min 100 Max 121	1810 kg / 3982 lbs
SMWA-MUL600	600 cm / 236 in	123	Min 100 Max 121	1900 kg / 4180 lbs
SMWA-MUL700	650 cm / 256 in	141	Min 100 Max 121	1950 kg / 4290 lbs

seppi m_ OLS-L MULCHING MOWER

A general purpose flail mower for grass maintenance at farms, reances, house paddocks, parks, etc. Versatile mower for the small land owner who demands more than a rotary mower.

Equipment
Specialty Equipment
Aerators
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Aercore 1500

Features

- 57.5-inch coring swath
- Up to 4-inch coring depth
- Flexi-link supporting arm keeps tines perpendicular to the ground longer for high-quality holes
- Fiberglass reinforced belts for quiet operation, simple maintenance
- Produces up to 900,000 holes per hour

Product features are based on published information at the time of publication. Product features are subject to change without notice. Contact your local John Deere dealer for more information.

Turfvent Core Caster Aerator

Model CTV-52 StarBurst™ Tine Aerator

Model CTV-52 StarBurst™ Tine Aerator

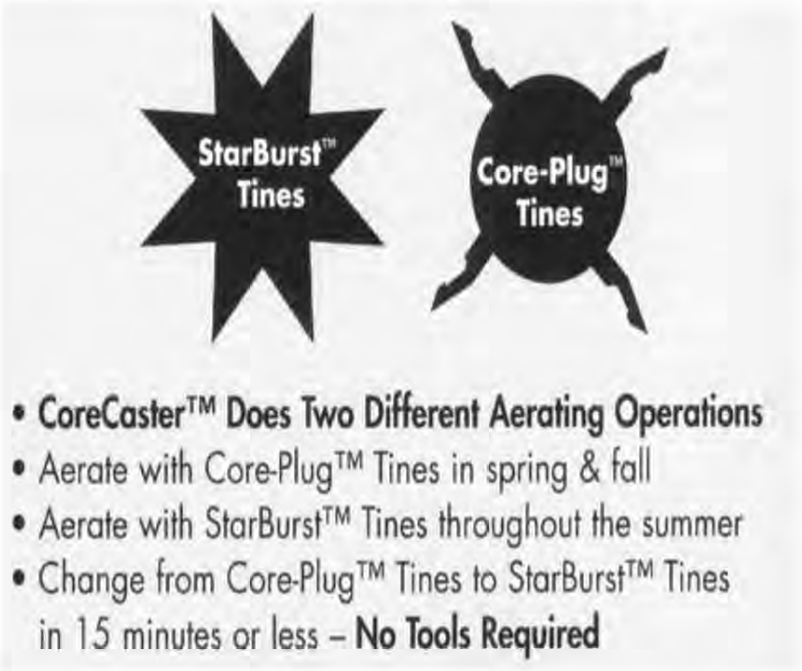
The Turfvent Corecaster Aerator uses a unique design that mounts the core plug/starburst tine wheels on a pivot. Aerate while turning in any direction, no matter how sharp the turn, while following any turf contour. The Corecaster lawn aerator, core plug aerator, mounts on all utility tractors with a category 1 three-point hitch, and fits most front mount commerical mowers. The unit comes both with a set of core plug tines, and with the solid tine, starburst aerator tines. The Corecaster lets you do two operations with the same machine - aerate with core-plug tines in spring and fall, pulling plugs and relieving compaction, and aerate with the starburst tines throughout the summer playing season leaving recreation

areas and athletic fields is perfect playing condition.

- **Features/Specifications**

- CTV-52 Corecaster aerator easily fits or adapts (using available adapter kits) to most commercial front mount mowers, or will mount on the category 1 three point hitch of any utility tractor
- Units come fully assembled and ready to use
- Has an effective aeration width of 52 inches, with an aeration pattern of 5 inches x 8 inches giving you 40 vents per square yard, or about 4.5 plugs per square ft.
- Weight is 290 lbs. unweighted, weight can be laid on frame for maximum aeration depth
- Frame width is 54.5 inches
- Frame depth (excluding pickup point hardware) is 27.5 inches
- Casters: 5 caster assemblies with 360 degree, dual quad tine clusters which rotate in, and pivot on, oil impregnated sleeve bearings (with grease fitting) with a thrust ball bearing (enclosed by a vinyl dust cap), supported by a Neoprene shock reducer
- Units have both TurfVent StarBurst or Core-Plug tines with 3.5 inch maximum penetration depth
- Aerator is John Deere iMatch hitch compatible
- Won't work with belly mount ZTR (zero turning radius mowers)

Model CTV-52 Core-Plug™ Tine Aerator



- **Model CTV-52 (3362):** Corecaster aerator, with both core tine set and Starburst tine set, mounts on rear of tractors with category 1, three point hitches, and mounts directly on the front of these commercial front mount mowers: Howard Price Turf Blazer 727; John Deere F710, F725; Kubota GF1800, GF1800E, F2260, F2560E, F2560, F3060, aerator weighs 350 lbs., shipped by truck - **Price is $2115.00 delivered**

- **Aerator Adaptor Arm Sets For Various Models Of Front Mount Commercial Mowers**
- **Model 3363:** Adaptor arm set for: John Deere - F911, F925, F932, F935, F1145; New Holland/ Ford CM222, CM224, CM272, and CM274, wt. of arm set is 19 lbs. - **Price is $115.00 plus $14.85 shipping (UPS)**
- **Model 3366:** Adaptor arm set for: Excell Hustler 3000 and 4000 series mowers, wt. of arm set is 19 lbs. - **Price is $159.00 plus $14.85 shipping (UPS)**
- **Model 3402:** Lift kit for all Jacobsen models, wt. is 5 lbs. - **Price is $57.00 plus $8.45 shipping (UPS)**
- **Model 3440:** Adaptor arm set for Steiner models 430, and 230, wt. is 21 lbs. - **Price is $167.00 plus $16.55 shipping (UPS)**

- **Model CTV-52-W (3369):** Corecaster aerator for Walker commerical mowers, includes the Walker Plate Assembly to connect with the Walker Quick-Change Implement Hitch System **(the hitch system is not included, only the plate assembly) - Price is $2229.00 delivered**

- **Accessories**

- **Model 3267:** Replacement tine set for CTV-52 and CTV-52-W, includes core plug tines and Starburst tines, wt. is 6 lbs. - **Price is $113.00 plus $9.85 shipping (UPS)**

- **Model 3533:** Adapter kit for JD1435, JD1445, JD1420 (2/4 wheel drive) - **Price is $115.00 plus $12.55 shipping (UPS)**

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