U.S. Department of the Interior
National Park Service

Pacific West Region
Cultural Landscapes Program

Whiskeytown National Recreation Area

Tower House Historic District
Interim Orchard Management Plan

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Interim Orchard Management Plan

National Park Service
Pacific West Region
Cultural Landscapes Program

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Management Summary

Tower House Historic District (THHD)

The Tower House Historic District (THHD) is located within Whiskeytown National Recreation Area (NRA) in Shasta County, California, approximately twenty miles northwest of Redding. The historic district is most commonly associated with the Camden House and Tower Hotel; however, the site also contains portions of four historic orchards dating from the period of significance, 1869 to 1933. These orchard resources represent some of the oldest surviving remnants of Whiskeytown's pioneer past and today serve as an important repository of heirloom fruit tree cultivars.

As early as 1853, numerous fruit and nut trees were planted and maintained by Levi Tower on the grounds of the Tower Hotel. During this period, the orchards and gardens were revered for their beauty and were often considered an important component of Tower's "showplace" hotel. After Tower's death in 1865, the fruit and nut trees were maintained by Charles Camden and his family. After Camden's death in 1912, the extant orchards were managed by his daughter, Grace Richards, and maintained by a tenant farmer until 1933. Throughout the mid to late-1930s, the fruit trees received some care under the ownership of Camden's granddaughter, Philena Hubbard. After Hubbard's last visit in 1941, the trees continued to be irrigated; however, they received very little maintenance after that time. The National Park Service acquired the site in 1969 and immediately began documenting the buildings, structures and associated landscape features on the property.

The Tower House Historic District was listed on the National Register of Historic Places in 1973 and is locally significant under Criterion A for its association with early Euro-American settlement in northern California during the Gold Rush. The district includes historic agricultural, transportation and mining resources developed by Levi Tower and Charles Camden during the late nineteenth and early twentieth centuries. The National Register nomination listed several buildings and structures as well as the orchards as contributing features of the historic district.

THHD Interim Orchard Management Plan

The THHD Interim Orchard Management Plan consists of five sections: *Introduction, Orchard History, Existing Orchard Conditions, Orchard Stabilization and Historic Fruit Tree Management and Orchard and Historic Fruit Tree Treatment.* The introduction (Section 1) includes the purpose of the document, study boundaries and a review of existing management information. The orchard history (Section 2) provides an analysis of significance, historic context information, as well as an illustrated chronology of physical development and repeat photographs. The existing orchard conditions (Section 3) provides an overall orchard site map as well as detailed information for each of the four orchard locations: Back Field, French Gulch Field, Tenant House and Camden House Yard. The stabilization and preservation maintenance measures (Chapter 4) provides recommendations for how to stabilize and preserve the THHD orchards and associated historic fruit trees in perpetuity. Finally, the treatment recommendations (Chapter 5) provide three alternatives with suggested recommendations for the Back Field, French Gulch Field and the Tenant House locations.

More specifically, the Interim Orchard Management Plan documents the historical development, significance and existing conditions of the orchards and fruit trees associated with the THHD utilizing information gathered through historical research and on-site field documentation. During the investigation, a total of 167 fruit and nut trees were documented within the boundaries of the THHD in four orchard locations. Approximately twenty-four percent of trees were identified as historic, while only twelve percent of the 167 documented trees were in good condition. Supplemental statistics identifying the total number of trees, species, historic status and condition by orchard location is provided in the existing conditions portion of the document.

Despite ongoing NPS stabilization and preservation maintenance activities, many of the historic fruit and nut trees situated within the THHD are in fair to poor condition. Age, pests, and disease as well as many other stressors including encroaching vegetation have contributed to the gradual decline of these trees. This plan recommends the implementation of numerous stabilization and preservation maintenance activities to enact specific, positive interventions to maintain and/or improve the condition of fruit trees within the historic district. Many different techniques are recommended to maintain the historic fruit trees and orchards, including pruning, mowing, brushing, irrigating, fertilizing, and mulching. Ultimately, germplasm conservation and continued propagation of extant historic trees will ensure that these unique and often overlooked resources will be preserved in perpetuity.

In addition to providing information related to the history, significance, existing conditions, and preservation and stabilization techniques, this plan provides treatment recommendations for the rehabilitation of representative orchard areas in the THHD in an effort to reestablish its historic character as well as enhance visitor opportunities at the THHD. The treatment section of the plan draws on the park's General Management Plan, Foundation Document and the THHD Cultural Landscape Interim Treatment Report as the basis for the development of treatment guidelines. Three alternatives were developed for the rehabilitation of representative orchard locations within the Back Field, French Gulch Field and Tenant House locations. The scope of the alternatives was developed in consultation with park staff, which included three strategies that were generally defined as "feasible" (Alternative #1), "intermediate" (Alternative #2), and "ambitious" (Alternative #3) rehabilitation options. The alternatives differ in the number of proposed new trees as well as several other details associated with interpretive opportunities, irrigation strategies and vegetation removal. Actions common to all alternatives include protection of existing cultural resources such as archeological sites and features, stabilization and preservation of orchard land use and historic orchard spaces, and the protection of historic orchards and fruit trees from health stressors and deterioration.

Section One: Introduction

Purpose and Overview

The purpose of the THHD Interim Orchard Management Plan is to review existing management information as well as document the historical development and existing conditions of the orchards and fruit trees associated with the historic district. Additionally, the document provides orchard management recommendations, which includes stabilization and preservation maintenance techniques, propagation planning and priorities for germplasm conservation. Finally, this plan provides treatment recommendations for rehabilitation of representative orchard locations within the THHD by offering three different alternatives for the Back Field, French Gulch Field and Tenant House.

The project was funded under PMIS 215915, "Develop Interim Historic Orchard Management Plan for French Gulch Field Orchard." Preparation of this plan was initiated with a site visit by Pacific West Region (PWR) staff in February 2016. While onsite Cortney Cain Gjesfjeld and Keith Park completed existing conditions documentation and individual fruit tree condition assessments. Additionally the PWR team worked with Whiskeytown National Recreation Area staff, Jennifer Gibson, Glendee Ane Osborne and Ellen Petrick, to establish park objectives and project scope. A subsequent visit was conducted by Keith Park in April 2016 to assist park staff with the collection of tree and vine leaf samples to support the potential identification of additional cultivars at the THHD through genetic testing.

The THHD Interim Orchard Management Plan utilizes the park's General Management Plan (GMP), Foundation Document and the Tower House Historic District Cultural Landscape Interim Treatment Report as the basis for treatment guidelines. The GMP identified rehabilitation and/or restoration of the THHD cultural landscape, including the "historic orchard and traditional/historic roads, trails, and irrigation systems." The 2008 Tower House Historic District Cultural Landscape Interim Treatment Report identified several district-wide and specific preservation management objectives associated with stabilization, preservation and rehabilitation of historic fruit trees and orchards at the THHD. Finally, the 2014 Foundation Document noted rehabilitation of the THHD, citing previous recommendations identified in the GMP and the Cultural Landscape Interim Treatment Report. Ultimately, the THHD Interim Orchard Management Plan will follow these park management documents, while adhering to the *Secretary of the Interior Standards for Preservation, with Guidelines for the Treatment of Cultural Landscapes.*

Information outlined in this document is intended to assist park staff with maintaining and preserving extant historic fruit trees associated with the THHD, while also offering recommendations to rehabilitate representative orchard areas that were identified in the Cultural Landscape Interim Treatment Report. This Interim Orchard Management Plan differs from a traditional Orchard Management Plan in that it offers a streamlined or abbreviated review of the historical development of the THHD as well as existing conditions. Additionally, treatment alternatives associated with the establishment of representative orchards focused on select locations based on discussions with park staff during scoping, which included the Back Field,

Tenant House and the French Gulch Field locations, rather than district-wide. The establishment of representative orchards was not prescribed for the Camden House Yard. In the future, a comprehensive plan should be included in Part II of the THHD Cultural Landscape Report (CLR) for the large-scale rehabilitation of vegetation associated with the Camden House Yard.

National Environmental Protection Act (NEPA) and Section 106 Compliance

The THHD Interim Orchard Management Plan recommends activities or "undertakings" that may alter the existing conditions of cultural resources at Whiskeytown National Recreation Area. Section 106 of the National Historic Preservation Act, the National Environmental Policy Act, and Director's Order 12: Conservation Planning, Environmental Impact Analysis and Decision Making outline a review process that is delegated to each park Superintendent to ensure that resources are not adversely impacted, that the public is fully informed of such activities and their potential effects, and that appropriate consultation occurs with interested parties. The process can occur at two different times: 1) during the development or at the completion of a planning document that recommends actions to be implemented; or 2) on an individual project basis as funding becomes available to complete specific activities.

This Interim Orchard Management Plan outlines actions that are intended to maintain and preserve the condition of historic fruit trees as well as offer recommendations for rehabilitation to depict representative orchards within the Tower House Historic District. It is anticipated that implementation of the plan will have no adverse effect under the National Historic Preservation Act on park resources. The suggested actions will, however, alter the existing condition of features at the site, and, as such, the recommendations warrant compliance review, including archeological testing of proposed tree-planting locations, prior to implementation. It is suggested that that Superintendent of Whiskeytown NRA submit this document for review to the park's Compliance Advisory Team, the California State Historic Preservation Office (SHPO) and the Tribal Historic Preservation Office (THPO).

Facilities Management Software System (FMSS)

3100 Maintained Landscapes (ML)

The park's historic orchards are part of Whiskeytown's "Maintained Landscapes" portfolio that must be entered and tracked in the Facility Management Software System (FMSS) database. The database is the NPS repository for capturing asset inventory data, work needs, condition and funding expenditures over time. Orchards are best captured in FMSS under the asset code 3100 module for Maintained Landscapes. Entering information into FMSS can help the park manage the preservation maintenance and future treatment of park orchards.

Currently, the park has one 3100-Maintained Landscape location associated with the THHD, which is noted in FMSS as "GRNDS – Towerhouse Historic Orchard" (100902). As stabilization, preservation maintenance, and rehabilitation activities advance, the existing 3100 Maintained Landscape location will need to be modified to reflect changing preservation maintenance and recurring maintenance needs for THHD fruit trees and orchards. The park should consider adding the four orchards as separate 3100-Maintained Landscape locations or alternatively establish each orchard area as a separate asset under the existing "GRNDS – Towerhouse Historic Orchard" (100902) location. Additionally, historic irrigation ditch systems, fences, vegetation groupings (fruit trees) and groundcovers should be added as assets associated with the orchards.

Work orders should be prepared for THHD orchards in the future, which may include fruit tree pruning, fruit tree watering, fruit tree pest and wildlife control, fruit tree mulching, orchard vegetation management and orchard floor maintenance.

For more information on cultural landscapes and FMSS please refer to the following documents:

- *Best Management Practices: Maintained Landscapes (3100) Asset*, Version 1.1, June 2, 2014 http://inside.nps.gov/waso/custommenu.cfm?lv=4&prg=190&id=10782

- *Business Practice: Maintained Landscapes (3100) Asset*, Version 1.1, June 2, 2014 http://classicinside.nps.gov/documents/3100_Maintained%20Landscapes_BP_2014.06.0211.pdf

- *Inspection Guidance: 3100 Maintained Landscapes*, Version 2.0, June 2, 2014 http://classicinside.nps.gov/documents/3100_Maintained%20Landscapes_IG_2014.06.021.pdf

- *Landscape Lines #17: Cultural Landscapes & NPS Facility Management* https://www.nps.gov/cultural_landscapes/Documents/Landscape_Lines_17.pdf

Study Boundaries and Spatial Data

The boundaries of this study include all orchard areas associated with the THHD, including the Back Field, French Gulch Field, Tenant House and the Camden House Yard. The orchard areas are located within the THHD as established in 1973 Tower House District National Register of Historic Places nomination form. Additionally, the four orchard areas were documented as contributing features to the THHD cultural landscape.

During this investigation, individual orchard boundaries were drawn to incorporate the locations of extant fruit trees that were documented by PWR staff using a hand held Trimble GPS unit in February 2016. To support the collection of existing conditions information, a data dictionary was developed to record the fruit trees within the THHD. The following information was collected for each fruit tree and can be located in the attribute table associated with the project GIS data:

- **Orchard Name** (French Gulch Field, Camden House Yard, Back Field, Tenant House)
- **Tree ID #** (current fruit tree trinomial)
- **Old ID #** (previous fruit tree numbering system used by park)
- **Tree Type** (Apple, Cherry Plum, Crabapple, Hazelnut, Pear, Persimmon, Quince, Cherry, Unknown, Walnut)
- **Variety** (American Summer Pearmain, Baldwin, Bartlett, Collamer Twenty Ounce, Derman Winesap, Duchess of Oldenburg, Early Joe, Grimes Golden, Hyde King, Jonathan)
- **Status** (Historic, Non-Historic, Unknown)
- **Tree Condition** (Good, Fair, Poor, Dead)
- **Comments**
- **Generic point and line information for other resources** (e.g. spillways, walls)

Additional GIS data was gathered from several sources and utilized to supplement the existing conditions maps. Data sources included PWR cultural resource historic district boundary and ditch information as well as park hydrology, roads and trails data.

Fruit Tree Field Identification Numbers

The existing Whiskeytown NRA trinomial fruit tree identification numbering system was utilized in this plan. Prior to completion of this plan, four orchard locations were identified at the THHD, including the Back Field, Camden House Yard, Tenant House and French Gulch Field. It should be noted that fruit trees historically associated with the Tower Hotel grounds were included in the Camden House Yard location.

The field identification numbers consist of three parts. The first part of the trinomial numbering system includes the area or location of the feature on site. The second set of characters indicates the fruit tree species category. The final portion of the field identification number is the individual feature in sequential order by location. Orchard locations include Back Field (BF), Camden House Yard (CY), Tenant House (TH) and French Gulch Field (FG). Fruit tree species or categories include: apple (Ap), pear (Pr), cherry (Ch), quince (Qu), persimmon, (Ps), crabapple (Ap), cherry plum (Cp), and walnut (Wa). See example below for additional information on how to interpret the trinomial number.

Bf-Ap-001

BF = Back Field
Ap = Apple
001 = Tree Number

The location of individual fruit trees on the ground does not follow a sequential pattern; however, tree numbers are generally clustered by orchard location. This numbering system is a direct result of the dynamic nature of biotic resources and reflects the locations of known fruit trees, newly discovered and/or planted trees as well as the location of stumps where trees have died. The location and identification of known fruit trees on the ground can be aided through the establishment of a well-defined tree identification tag system, which is discussed in greater detail in the orchard management section of the document. Additionally, the existing conditions maps and field maps found in this plan as well as supporting documents can assist users with the location of previously documented fruit trees in the field.

Review of Existing Management Information

The management objectives for the Tower House Historic District orchards are derived from the park's General Management Plan (1999), Foundation Document (2014), the Cultural Landscape Interim Treatment Report (2008) and the Cultural Landscape Report, Part I (2001). These documents define the objectives for the park and the associated Tower House Historic District. In addition, these documents provide information regarding the significance and integrity of park's resources, existing conditions, interpretive goals and visitor use and experience.

General Management Plan

The park's General Management Plan (GMP) provides the basic management philosophy for the landscape, including the orchards. The plan calls for rehabilitation and/or restoration of the THHD cultural landscape, including the "historic orchard and traditional/historic roads, trails, and irrigation systems."[1] Based on recommendations outlined in the GMP, the THHD Interim Orchard Management Plan prescribes recommendations for stabilization and preservation of park orchards as well as alternatives for the rehabilitation of representative orchards in select locations within the historic district.

Foundation Document

The park's Foundation Document provides basic guidance for planning and management decisions. It includes information related to the park's purpose, significance, fundamental resources and values, and interpretive themes. Additionally, the document provides a description of planning needs, which includes the proposed development of a Comprehensive Plan for the Tower House Historic District. Within this context, the Foundation Document noted:

> *"…The park desires to rehabilitate the site in order to improve the condition of the district and implement site recommendations that are stated in the park's general management plan and the 2008 cultural landscape interim treatment report. Through this process, the park would identify the key features and aspects of the district that require preservation, restoration, and/or rehabilitation in order to maintain the integrity of the district. Developing a comprehensive plan for the district would help to integrate the overall management of visitor use and the district's diverse resources that include prehistoric archeological sites, historic structures, extensive cultural landscapes, and a historic orchard with more than 100 fruit trees. The plan would also address cultural and natural resource compliance needs that are required before implementing some of the treatment recommendations outlined in previous planning documents and ensure actions proposed meet current NPS law, regulation, and policy as well as visitor needs."*[2]

[1] National Park Service, General Management Plan Whiskeytown Unit, Whiskeytown-Shasta-Trinity National Recreation Area, 1999, 13.
[2] National Park Service, Foundation Document Whiskeytown National Recreation Area, California, July 2014, 21.

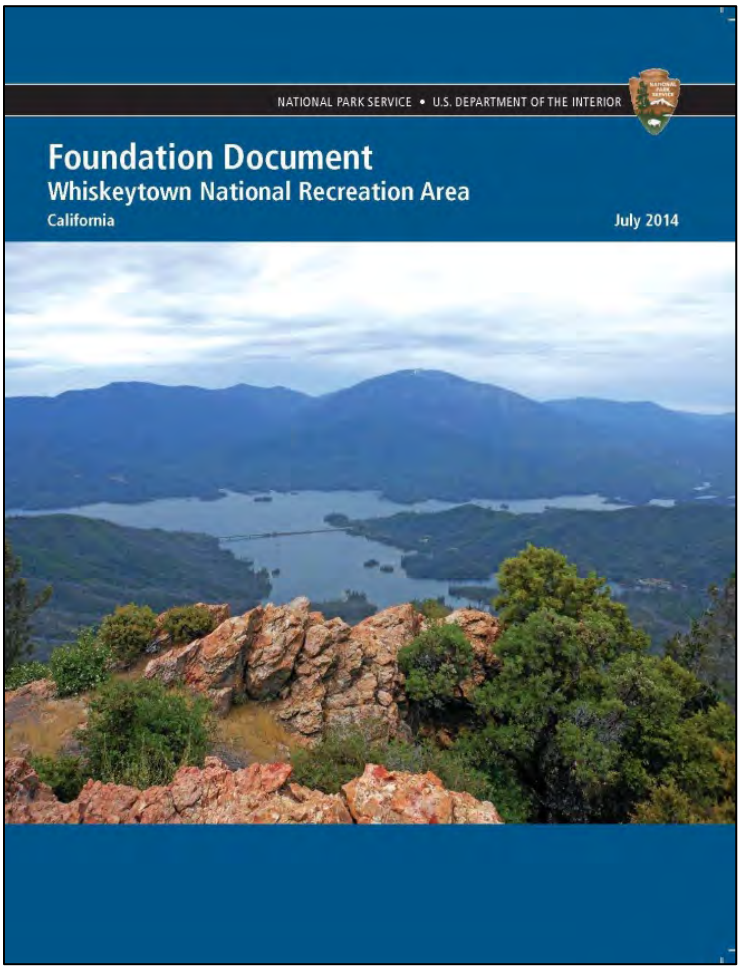

Figure 1.1: Cover of the Foundation Document for Whiskeytown National Recreation Area, July 2014.

Cultural Landscape Interim Treatment Report

The Cultural Landscape Interim Treatment Report for the Tower House Historic District identified preservation as the primary treatment for the THHD. Rehabilitation was identified as a secondary treatment that would be applied in discrete areas to fulfill specific management objectives. The document outlined several district-wide as well as specific preservation management objectives directly associated with the THHD orchards. District-wide treatment goals focused on stabilization and preservation of historic structures and features, replacement of missing features, removal of incompatible features and the addition of compatible alterations through rehabilitation activities. It also identified the park's desire to more fully depict the character of the cultural landscape as established during the period of significance (1869-1933) with an emphasis on the primary period of development, 1869-1912. Specific preservation management objectives focused on rehabilitation of historic spaces and vegetation including the orchards and irrigation system.

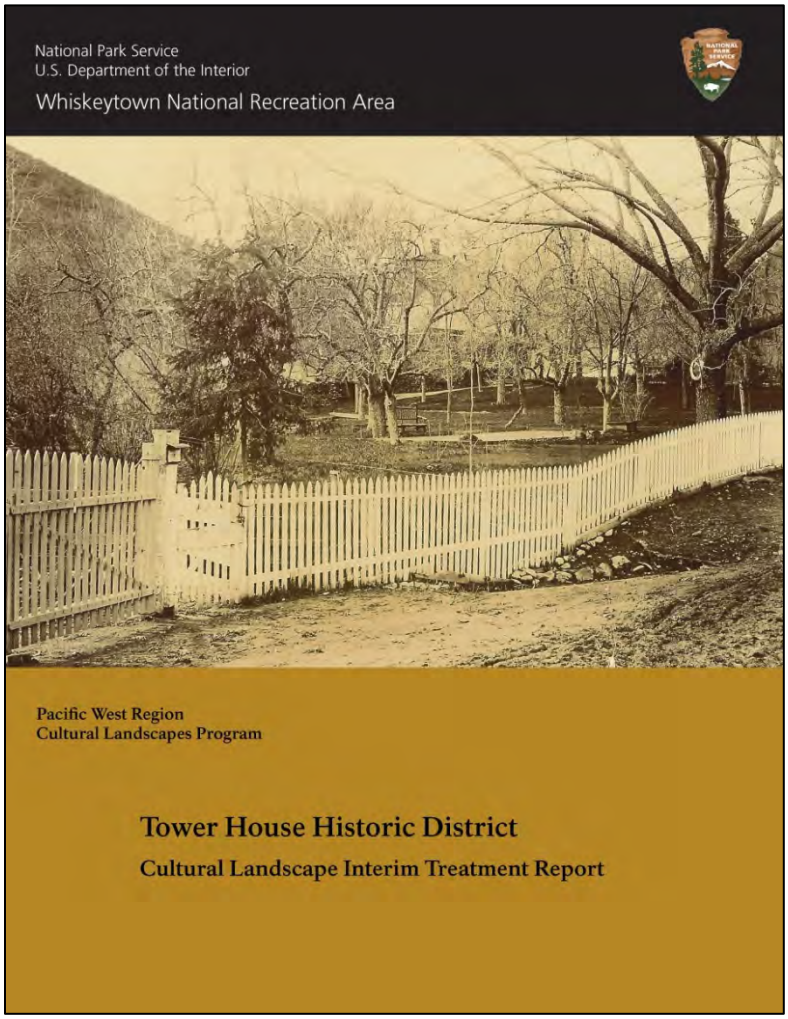

Figure 1.2: Cover of the Tower House Historic District Cultural Landscape Interim Treatment Report, 2008.

A total of seven management zones were established within the Cultural Landscape Interim Treatment Report for the THHD. The zones included French Gulch Field, Back Field, Tenant House, Camden House Yard, Tower Hotel Grounds, Toll Road Segment, and the Kate Camden Grave. Four orchard locations, which were heavily influenced by the above-mentioned management zones, were identified in this Interim Orchard Management Plan. It should be noted that the Camden House Yard and Tower Hotel Grounds zones were combined in this document into the Camden House Yard to align with existing park management practices.

Zone treatment goals and general actions specific to THHD orchards and fruit trees identified in the Cultural Landscape Interim Treatment Report are provided below.

French Gulch Field Management Zone

- *Stabilize and preserve historic vegetation: fruit trees – deadwood, remove suckers, remove competing vegetation, brace leaning trees, mulch below canopies.*

- *Stabilize and preserve irrigation system: re-open ditch near Yreka Road trace – remove encroaching vegetation and re-delineate trench by removing in-filled soil; investigate ditch system and historic connection from Upper Crystal Creek Ditch to French Gulch Field; Interpret irrigation ditch; use ditch to irrigate French Gulch Field.*

- *Rehabilitate representative orchard: fruit trees – propagate fruit trees from existing and representative varieties of pear, apple, peach, cherry; plant and maintain one to two acres of representative orchard; plant trees in a 30-foot grid; protect archeological resources through testing, mitigation and avoidance.*

Back Field Management Zone

- *Stabilize and preserve historic vegetation: fruit trees – deadwood, remove suckers, remove competing vegetation, brace leaning trees, mulch beneath canopies.*

- *Stabilize and preserve historic spaces: field area – reveal former extent of field by removing encroaching vegetation – use exotic plant treatment protocols and brush hog to achieve low, herbaceous ground cover.*

- *Rehabilitate historic orchard: fruit trees – propagate fruit trees from existing and representative varieties of pear and apple; maintain two to three acres of representative orchard; plant fruit trees in a grid pattern that reflects historic traditions (30 x 30-foot spacing, resulting in 40 trees per acre); assess archeological sites and features located in the Back Field; perform archeological testing before planting fruit trees; investigate extent of historic orchard near the Tower Gravesite.*

- *Rehabilitate visual connection: Back Field historic and natural scene – remove encroaching trees in the southern Back Field and near the barn; remove non-contributing trees in the middle of the Back Field.*

- *Rehabilitate boundary around the rehabilitated orchard: re-establish compatible fence – establish compatible fence in the Back Field to prevent horse browsing.*

- *Remove incompatible vegetation in the Back Field: non-historic vegetation – remove native and exotic woody vegetation within field to establish low, herbaceous ground cover between fruit trees; manage field vegetation for rehabilitation of the orchard and associated ditch system.*

Tenant House Management Zone

- *Stabilize and preserve historic vegetation: fruit trees – deadwood, remove suckers, remove or thin encroaching overstory vegetation, brace leaning trees, and mulch under canopies.*

- *Rehabilitate representative fruit trees: fruit trees – propagate fruit trees from existing and representative varieties; plant fruit trees to replace declining fruit trees to retain presence of fruit trees in vicinity.*

Camden House Yard Management Zone

- *Stabilize and preserve historic vegetation: historic fruit trees – deadwood, remove suckers, remove competing vegetation, brace leaning trees, mulch beneath canopies; prioritize stabilization of historic fruit trees such as pear, filbert and apple trees over non-contributing vegetation.*

Tower House Hotel Grounds Management Zone

- *Stabilize and preserve historic vegetation: historic fruit trees – deadwood, remove suckers, remove competing vegetation, brace leaning trees, mulch under canopies.*

- *Rehabilitate Tower House Hotel grounds to demarcate edge of maintained area: install fence – identify maintainable area comprising historic fruit trees; install compatible mill lumber/peeled pole and wire fence to demarcate maintained area and protect historic fruit trees; perform archeological investigations and testing prior to installation of fence.*

Cultural Landscape Report, Part I

A Cultural Landscape Report, Part I (CLR) was completed for the Tower House Historic District in 2001. This document describes the history and significance of the park cultural landscape, summarizes existing conditions and offers an analysis and evaluation of key landscape characteristics. Part II of the CLR was not completed and as a result, the document does not provide an overall treatment philosophy, approach, or guidelines for treatment of the park's cultural landscape, including park historic fruit trees and orchards. Preliminary recommendations were provided in the appendix of the report; however, they do represent formal THHD treatment strategies or objectives.

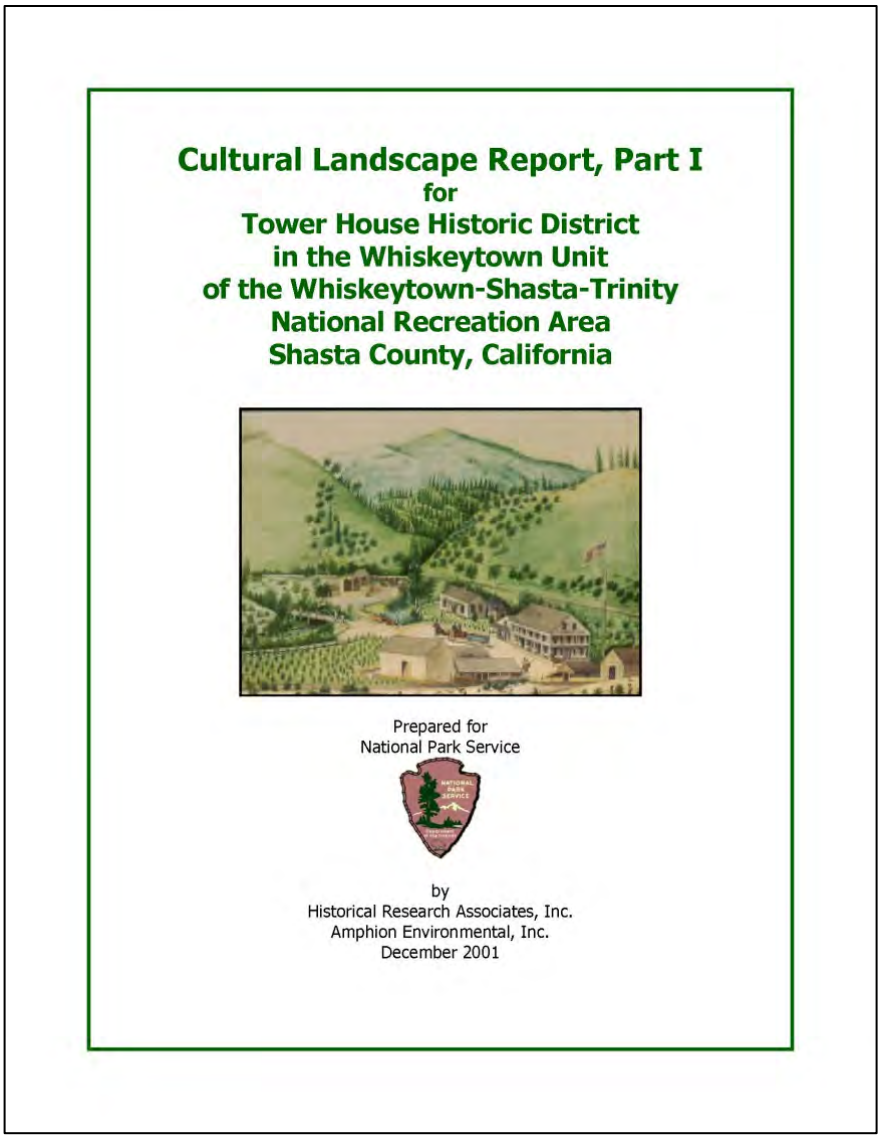

Figure 1.3: Cover of the Cultural Landscape Report, Part I for the Tower House Historic District, December 2001.

Section Two: Orchard History

Historic Context

Brief Summary of California Orchard Culture

Some of the earliest known cultivated fruit trees in California were associated with the Spanish mission system that began in 1769 and extended to 1833. During this period, many of the missions, which were situated in southern and coastal California, included small "fruit gardens" where horticultural crops such as seedling apples and pears as well as peaches, grapes, quince, olives and walnuts were grown.[3] By the late 1840s and early 1850s, American entrepreneurs and pioneers, many of whom were associated with the Gold Rush, practiced the cultivation of fruit trees both at a commercial level as well as within kitchen and farm orchards using stock brought from the East Coast. Most often newcomers planted apple and peach trees, which were followed in popularity by pear, plum and cherry trees. As these orchards became established, early California horticulturalists supplemented their operations with stock procured from nurseries in the Pacific Northwest as well as from remnant fruit and nut trees associated with Spanish missions in an effort to provide fresh produce to the rapidly growing population of the state.[4]

Despite early fruit production activities associated with the missions and later entrepreneurs, the intensive cultivation of fruit crops did not begin in California until the late nineteenth century. Sources estimate that by 1880 there were approximately four million apple, apricot, peach, pear and plum trees in California and by 1900 more than twenty-seven million fruit trees had been planted in the state.[5] Ultimately, this dramatic increase was attributed to a number of factors, which included an increase in the available workforce, development of irrigation and better transportation systems to bring produce to market.[6] As new technologies emerged, the production of fruit and nut crops continued to rapidly develop in California throughout the 1920s and beyond with significant increases in acreage associated with grape crops as well as subtropical fruit and nut crops. Today, California's fruit and nut industry has remained viable and increasingly dynamic with an abundance of intensive, specialized crops.[7]

[3] H.M. Butterfield, "Early Days of California's Pear Industry," *History of Deciduous Fruits in California*, July 1938, 4. Article reprinted from *The Blue Anchor*, official publication of the California Fruit Exchange, Sacramento, California, Vols. XIV and XV, August 1937 to April 1938.
[4] Clarence W. Olmstead, "American Orchard and Vineyard Regions," *Economic Geography*, Vol. 32, No. 3 (Jul., 1956), 211.
[5] *Determination of Eligibility, Condition Assessment and Stabilization Plan for Sonoma Developmental Center Orchard at Jack London State Historic Park*, National Park Service, Pacific West Region Cultural Landscapes Program, 2007, 30.
[6] Ibid.
[7] Ibid., 30-31.

Early Nurserymen

The origins of the American fruit-growing industry in California were closely associated with the nursery business. Author, Paul W. Gates notes in *California Ranchos and Farms* that with few exceptions it was the nurserymen who developed the primary fruit orchards of the mid-nineteenth century.[8] Numerous sources suggest that early Oregon nurserymen, Henderson Luelling (also spelled Lewelling) and his brothers Seth and John, were especially influential in the introduction of cultivated fruits in northern California in the early 1850s. By 1856, several large operations associated with nurseries, fruit cultivation, and wine production had been established in California. Owners and operators included E. L. Beard and John Lewelling of Santa Clara County, the Thompson Brothers of Napa and Solano counties, William Wolfskill of Los Angeles and A.P. Smith of Sacramento amongst many others.[9] Less than a decade later, nurseryman Felix Gillet of Nevada City would also play a pivotal role in the distribution of fruit and nut trees in the region. Collectively, these early nurserymen helped to advance the practice of horticulture throughout the state during the mid to late-nineteenth century.

The cultivation of fruit and nut trees associated with the Tower House began as early as 1853 by Levi Tower. Historical documentation suggests that Tower procured fruit and nut trees from many different sources. Reports indicate that some of the trees were imported over the Isthmus of Panama, while other sources suggest that a number of trees in Tower's orchard were shipped to California around Cape Horn (a five-month journey from the East Coast).[10] Other documentation suggests that the fruit trees were procured from nurseries located in Oregon, which were undoubtedly linked to Henderson Luelling.[11] While the details of the origin of many of the earliest trees associated with the THHD remains unknown, it is likely that the orchards represented a varied assemblage of fruit and nut trees from various sources around the country. Today, eight cultivars have been positively identified in the THHD and include variations of four varieties noted in Luelling's original cargo: [Derman] Winesap, Lady, Baldwin, and White [Winter] Pearmain.[12]

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[8] Paul W. Gates, *California Ranchos and Farms 1846-1862: Including the Letters of John Quincy Adams Warren of 1861, Being Largely Devoted to Livestock, Wheat Farming, Fruit Raising, and the Wine Industry*. (Madison: The State Historical Society of Wisconsin) 1967.

[9] Ibid.

[10] Russell Bevil and Elena Nilsson, *Cultural Resources Overview of the Whiskeytown Unit, Whiskeytown-Shasta-Trinity National Recreation Area, Shasta County, California*. Mountain Anthropological Research and URS Corporation, Chico, CA, 2001, 134.

[11] National Park Service, Camden House Historic District Cultural Landscape Inventory, 2003, Part 2a.

[12] Luelling's son recalled the following list of species and cultivars, which were first brought to Oregon by his father: *"Summer Apples—Sweet June, Red Astrachan, Golden Sweet, Summer Pearmain, and Summer Bellflower. Autumn Apples—Gravenstein, Red Cheek Pippin, Seek-No-Further, Rambo, King of Tompkins County. Winter Apples—Golden Russet, Yellow Bellflower, Tulpahocken, Baldwin, Lady Apple, White Pearmain, Northern Spy, Esopus Spitzenberg, Winesap, Yellow Newtown Pippin, Jenneting. Summer Pears—Bartlett, Early Butter. Autumn Pears—Seckel, Flemish, Fall Butter. Winter Pears—Winter Nelis. Cherries—Royal Ann, Black Tartarian, Black Hearth, May Duke, Kentish. Peaches—Crawford's Early, Crawford's Late, Golden Cling. Grapes—Isabelle, Delaware, Concord. Also Siberian Crab Apple and Orange Quince."* For more information see: W.P. Duruz, "Notes on the Early History of Horticulture in Oregon: With Special Reference to Fruit-Tree Nurseries", *Agricultural History*, Vol. 15, No. 2 (Apr., 1941), 91.

Shasta County

Numerous orchards and gardens were established in California following the Gold Rush of 1848. Shasta County Surveyor, A.H. Stout, reported in 1855 that peaches led the way in fruit production in the county, followed by apples and quince.[13] In 1857, Shasta County claimed around 4,000 inhabitants, many of whom were engaged in agricultural pursuits.[14] The *State Register* noted that in 1858, Shasta County had more than 7,000 peach trees, 4,000 apple trees, 1,000 apricot trees, and 1,800 assorted pear, plum, cherry, nectarine, quince, fig, pomegranate, almond and walnut trees. [15] Additionally more than 25,000 grapes had been planted in the county. It is probable that Tower and Camden's orchards were among the acreages accounted for in 1858.

Less than thirty years later, in 1887, agricultural boosters printed a promotional article for the Redding locale proclaiming that:

> *"The country adjoining the city on the east side for about eighteen miles is a table-land, cut north and south by three beautiful valleys. It is in every sense a horticultural section, being the best in the State for the production of the peach, apricot, nectarine, almond, cherry, fig, pear, prune, grape and olive.…Thousands of acres of orchard have been planted during the last three years, and in a few years more the cannery started this year on a small scale, will have to be remodeled for the accommodation of those who have been so fortunate and foresighted as to plant fruit trees and vines."*[16]

Within the first decade of the twentieth century, new orchards and associated fruit and nut trees continued to be planted in Shasta County. By 1908, Shasta County housed large plantings of fruit trees, which included 5,000 apple trees, 9,000 olive, 25,000 peach, 20,000 pear, 70,000 prunes, 250 lemons, 800 orange and several other types of fruit trees, which totaled 149,350 trees. Additionally, approximately 3,750 nut trees were located within the 4,050-square-mile county.[17] Notably, 83 miles of irrigation ditch delivered water to the county's orchards. Many of these fruit trees were located in the southern part of the county that extended from the vicinity of Redding to Cottonwood, including the "famous fruit-growing sections of Happy Valley, Anderson Valley and Cottonwood." [18] By 1910, over 262,136 fruit trees were growing in the county. [19] Of these, peach trees were the most abundant, followed closely by plum and prune.

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[13] Edward Petersen, *In the Shadow of the Mountain: A Short History of Shasta County, California,* 1965, 106-107.
[14] Rosena A. Giles, *Shasta County California: A History*, (Oakland, California: Biobooks) 1949, 162-163.
[15] Shelly Davis-King, *Bringing Water to the Garden: A Description of Two Ditches in the Tower House Historic District, Whiskeytown National Recreation Area, Shasta County, California*, 1997, 2.
[16] Promotional article on the back on a 1887 maps of Redding from California State Library, California Section Print Collection. Article retrieved from the Boggs Collection at the Shasta Public Library.
[17] David Walker, *Shasta County California* (San Francisco: Sunset Magazine Homeseekers' Bureau) 1908, 6-7.
[18] Ibid.
[19] Petersen, 106-107.

Additionally, the number of nut trees, particularly almond and walnut, increased during this period.

In 1915, the Horticultural Commissioner for Shasta County, George A. Lamiman, indicated that "The fruit industry shows a diversity of varieties planted and being planted through the fruit districts, such as apricots, apples, almonds, cherries, citrus, figs, grapes, olives, pears, prunes, peaches, plums and walnuts." The most commonly planted varieties of apples during this period included winter cultivars such as Spitzenberg, Winesap, Baldwin, Arkansas Black, Ben Davis, Delicious, Bellflower, and Newtown Pippin. Cherry cultivars planted in the county primarily included Black Tartarian, Black Oregon, and Royal Ann as well as many other experimental varieties. Grapes grown within the valleys and foothills of Shasta County included Malaga, Muscat, Tokay, Rose de Peru, Cornichon, Thompson and Sultana. Bartlett was the primary pear crop due its ability to both ship and can well. Other popular pear cultivars included Easter Beurre and Winter Nellis. The most popular varieties of freestone peaches in Shasta County were the Muir, Elberta, Crawfords, Lovell and Salway, while the Tuscan, Orange and Heath were popular clingstones. Finally, the popularity of walnuts was gaining momentum in 1915 with a large number of the Franquette types being planted.[20]

Ultimately, Shasta County was known as a fruit producing center through much of the early twentieth century until the 1930s when alfalfa largely replaced prunes and other fruit crops as the area's leading agricultural product.[21] The following table illustrates the decline of the cultivation of apple trees and the growth (and eventual decline) of grape cultivation in Shasta County from 1909 to 1943.

Bearing Acreage of Apples and Grapes between 1909 and 1943, Shasta County, California

Year	Bearing Acreage in Apples	Bearing Acreages in Grapes
1909	545	235
1919	490	234
1929	415	623
1939	296	427
943	255	357

Table 2.1: Table showing the bearing acreage of apples and grapes in Shasta County, California between 1909 and 1943.[22]

[20] M.E. Dittmar, *Shasta County, California* (Shasta County: Sunset Magazine Homeseekers' Bureau for the Board of Supervisors, Shasta County) 1915, 37-38.
[21] Petersen, 106-107.
[22] Statistical Information on Shasta County Agriculture, 1899-1944, prepared for County Agricultural Economic Conference and Sponsored by the Agricultural Extension Service, November 1944. Boggs Collection at the Shasta Public Library.

Tower House Historic District Orchard Significance

The orchards and fruit trees associated with the THHD were noted as contributing resources in the National Register of Historic Places nomination form for the Tower House Historic District. Additionally, the four remnant orchards were noted as contributing features in the Cultural Landscape Inventory (CLI) for the historic district. Despite inclusion of these resources into the above-mentioned documentation, very little analysis has been completed regarding the significance of the historic fruit trees and orchards at the THHD.

Fruitful Legacy

Recent literature on the subject, including the *Fruitful Legacy: A Historic Context of Orchards in the United States* prepared by Susan Dolan provides additional context in which to evaluate the historic significance of orchards and fruit trees in the United States. This information can help us better understand the historic significance of remaining historic trees associated with orchards across the country as well as within the Tower House Historic District. The following analysis utilizes information from the *Fruitful Legacy* and provides a summary of two historic periods of orchard and fruit tree culture in the United States and how they are relevant to extant fruit trees located within the THHD.

The historic fruit trees and orchards associated with the THHD represent two historic periods of orchard and fruit tree culture in the United States. The first period, defined by fruit diversification and migration, began in 1801 and extended to 1880. This period began with the "golden age of pomology" and ended with the dawning of the "industrial revolution" in fruit growing. During this period, orchards were laid out with relatively wide spacing between trees.[23] The trees had tall trunks and a large, unpruned canopy. Dwarf apple and pear trees were available from nurseries; however, dwarf trees were generally only found in fruit gardens, which remained distinct from commercial operations.

The second applicable period in the history of fruit tree culture associated with the THHD is described as the modern period and extended from 1880 to 1945. This period represents orchard specialization and industrialization and was characterized by a dramatic decrease in the number of varieties grown. It was also indicative of advances in orchard management through scientific research. During this period, fruit trees were planted to exhibit short trunks (18 inches to 3 feet high), and pruned tree form (open bowl style). The orchards also exhibited a wide geometry of tree layout.[24]

[23] Susan A. Dolan, *Fruitful Legacy: A Historic Context of Orchards in the United States, with Technical Information for Registering Orchards in the National Register of Historic Places*. (U.S. Department of the Interior, National Park Service, Olmsted Center for Landscape Preservation, Pacific West Regional Office, Cultural Resources Program; Park Historic Structures and Cultural Landscapes Program) 2009, 62.
[24] Ibid., 111.

Today, the THHD orchards contain remnants of both above-described periods of fruit tree culture and in many ways represents a transitional period in orchard and fruit tree culture in the western United States. In the early 1850s, pioneers such as Levi Tower acquired stock from nurseries and experimented with various fruit and trees onsite, which set the groundwork for a well-established home or farm orchard. Later, under the management of Charles Camden, the orchards were expanded. During this period, Camden likely incorporated new scientific approaches to orchard management, including the introduction of large blocks of single species. While many of the trees that remain today likely date to the modern period, 1881 to 1945, the diversity of known cultivars represented at the THHD offers an interesting glimpse of past endeavors and with additional germplasm identification will offer greater context for understanding orchard activities and trends at the site through time.

Illustrated Chronology of Orchard Development

1850

- Charles Camden located a claim on Clear Creek and constructed a cabin onsite.

1852

- Levi Tower posted a claim notice for land situated at the confluence of Clear, Willow and Crystal creeks. Within the year, Tower constructed an irrigation system on the property to support the cultivation of agricultural crops and fruit trees.

1853

- The *Shasta Courier*, described the improvements that Levi Tower had made to the property reporting that *"… now he is residing in a fine and commodious building, and his grounds several acres in extent, are enclosed in good paling fence, and in a high state of cultivation—producing in abundance all the vegetables grown in this section of the state. He has also growing large numbers of peach, apple, pear, cherry, and other fruits. And not the least attraction about his premises are two or three hundred chickens and several hundred hogs. In short he has a regular old fashioned home."*[25]

Figure 2.1: Historic photograph showing the Tower House and associated buildings and structures, n.d. Note new plantings in front of the hotel, which potentially could be fruit trees (Whiskeytown NRA).

[25] Anna Coxe Toogood, *Historic Resource Study Whiskeytown National Recreation Area, California*, Denver Service Center, May 1978, 133.

1854

- The following year, the *Shasta Courier* noted that *"L.H. Tower has several trees in his garden at the Tower House, of but three years growth, now bearing a goodly number of very large peaches….We also observed in the same garden a large bunch of grapes hanging upon a vine of the present season's growth; while water melons, musk melons, etc. were lying about in rich profusion.* [26]

1855-1858

- Camden constructed the Crystal Creek Ditch, which included a trestle and flume located at the upper end of the orchard across from Clear Creek.

Figure 2.2: Historic photograph showing the Crystal Creek Ditch flume, n.d. (Whiskeytown NRA).

[26] Toogood, *Historic Resource Study*, 134.

1857

- An enthusiastic correspondent wrote that Tower's garden claimed two large crops of apples in one season and a pear that weighed 2 ½ pounds.[27]

1858

- Camden purchased the Tower House property and leased it back to Levi Tower.

- An article noted that Levi Tower had bearing pear trees on his property as early as 1858.[28]

- The Tower House developed into a popular stop—famous for its flower gardens, vegetable gardens, and orchards. A report on Shasta County farms offered the following description of Tower's property:

  "He now has thirty acres inclosed [sic] with good fence, and thoroughly cultivated. The orchard contains one thousand trees of apples, pears, peaches, plums, cherries, apricots, nectarines, etc., all choice varieties of working fruit…..There are also four hundred grape vines….One of the apple trees shown the Committee was from seed planted in the Spring of 1854. In the Spring of 1857 it blossomed—set and ripened fruit in the month of July—matured a second crop in August, and set a third, which were as large as English walnuts when the frost came and interrupted their grown. The first and second crop reached an average of twelve and one-half inches in circumference—were slight and of excellent flavor….There is also a nursery on the place of one thousand trees, assorted fruits, beside fine rows of gooseberry, currant, raspberry, and strawberry bushes, all bearing profusely."[29]

1860

- Tower planted Japanese walnut on the property about 1860. A fruit and nut expert later noted that:

  "It makes a beautiful tree but the nuts are small and of little to no commercial importance."[30]

[27] Giles, 162-163.
[28] Butterfield, "Early Days of California's Pear Industry", 4.
[29] National Park Service, Camden House Historic District Cultural Landscape Inventory, 2003, Part 2a, Page 3 of 21.
[30] Harry M. Butterfield, *A History of Subtropical Fruits and Nuts in California*, University of California Division of Agricultural Sciences Agricultural Extension Service, 1963, 42.

1861

- Traveler, Richard G. Stanwood visited the Tower Hotel, and remarked that:

  "The fruit is principally apples and peaches. All the trees were loaded down with splendid fresh looking fruit…a delightful spot with the finest orchard I have seen in the State, though not the largest, and plenty of beautiful shade trees."[31]

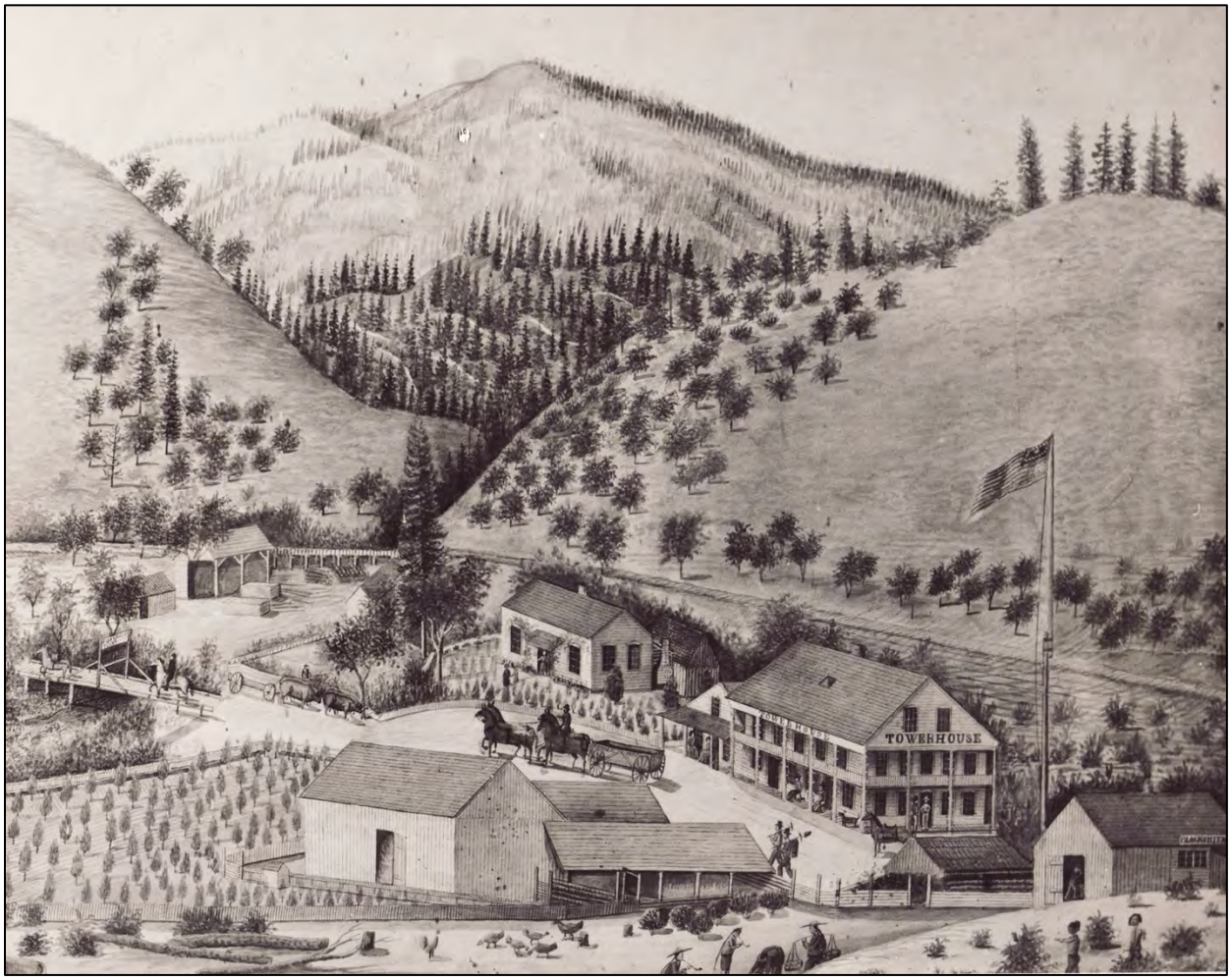


Figure 2.3: Historic image showing the buildings, structures, circulation, small scale features and vegetation associated with the Tower House, n.d. Note the orchard in the foreground (Whiskeytown NRA).

[31] Toogood, *Historic Resource Study,* 16.

Figure 2.4: Historic photograph of Levi Tower holding a branch of peaches, n.d. (Whiskeytown NRA).

1865

- Levi Tower died on November 17, 1865 and was buried at the southwest end of the Back Field.

1867

- Camden posted a "For Sale" advertisement in the *Red Bluff Independent* newspaper for the Tower House property. The hotel, bridge, blacksmith shop, and all out buildings were located in one lot, while the orchard and the garden were in another lot.[32]

[32] "For Sale", *Red Bluff Independent*, December 11, 1867.

1869

- Andy Cusick purchased the two-acre Tower House property from Camden. The *Sacramento Daily Union* newspaper noted that the:

  "…Tower House has long been noted as the most pleasant place of Summer resort in this portion of the State, and we presume Andy will endeavor to render it still more attractive, if possible."[33]

Figure 2.5: Historic photograph of the Tower House, n.d. Note the mature trees in foreground as well as grazing animals to the left (Whiskeytown NRA).

1875

- A "Bonanza Pear" was grown by Charles Camden on the property. The pear reportedly weighed "*four pounds two ounces; the measure was 6 ¾ inches high, 19 ½ inches around the circumference of base, and 21 inches around the height.*"[34]

[33] "Shasta County", *Sacramento Daily Union*, March 9, 1869.
[34] "Bonanza Pear", *Pacific Rural Press*, December 18, 1875.

1877

- Charles Camden exhibited a "peculiar walnut" at a meeting of the State Horticultural Society. In March 1877, the *Call* published the following letter from Camden, which provides some additional information regarding the tree:

  "Tower House, Shasta Co., Cal., March 9, 1877.—Sixteen or eighteen years ago, Mr. Tower, the then proprietor of this place, planted a variety of nuts in nursery, including the English and black walnuts, butternuts, hickory, chestnuts, pecan, and the nut that produced the kind you refer to, but where he procured them I cannot say. He or the gardener at the time denominated them the Spanish walnut, and we give them the same name still; whether properly or not, I cannot say. The tree is a very thrifty grower; one now measures 44 inches in circumference. It develops in very handsome form after first turning to shape, and needs no pruning, the limbs producing no surplus laterals. The foliage is lighter green than the English walnut, with narrower and longer leaf; bears the fruit in straggling clusters, 10 or 12 to the bunch; matures and bears earlier than the English walnut, and is more productive and regular, and the nut has a thin hull or husk. The flavor, as you observe, is something like the butternut, but it is far less oily and much superior; in fact, a most excellent nut in taste, although hard. The shell is thin, full and sure kernel, and the skin covering free from bitterness and objection. On the whole, I regard it a fine acquisition of the nut family. The nuts you saw are hardly up to a fair average, the tree having overborne, and not receiving regular attention as to irrigation.—Charles Camden."[35]

1885

- In the *Descriptive Circular of Shasta County*, published in 1885 (twenty years after the death of Tower), the author praised fruits grown on the Tower House property noting that:

  "…and here, we believe, the first experiments in the county of raising fruit and berries were made by Levi Tower, proving a success beyond the most sanguine expectations; and the dried fruit from the orchard of Mr. Camden continues, to this day, to bring an extreme price in the market of San Francisco. Bartlett pears weighing four pounds are no uncommon productions at this orchard."[36]

[35] "Siebold Walnut—Juglans Sieboldiana", *The Pacific Rural Press*, January 8, 1881.
[36] Anna Coxe Toogood and David G. Henderson, *Historic Structure Report Tower House Historic District, Historical and Architectural Data Section, Whiskeytown National Recreation Area, California*, National Park Service, Denver Service Center, May 1973, 48.

1891

- Tower received a noteworthy mention in *Pen Pictures From the Garden of the World, Memorial and Bibliographical History of Northern California* (Chicago), published in 1891. It noted that:

  "In 1852 was the building of the present commodious Tower House and planting of the orchards, the trees being procured, some over the Isthmus of Panama and some from nurseries in Oregon, at extremely high cost."[37]

1898

- Camden ordered fifty new peach trees, which were planted in the French Gulch Field.
- Several entries from Grace Richards' diary describe activities associated with the fruit trees and orchards in 1898.
  - August 23, 1898: *"Aut picking waxbane apples today, and watering road and flower garden"*
  - November 15, 1898: *"Papa finished pruning grapes and currents."*

Figure 2.6: Historic photograph of fruit trees in the French Gulch Field, n.d. Note the pruned open bowl shape of the fruit trees, which was a character-defining feature of fruit trees planted between 1880 and 1945 (Whiskeytown NRA).

[37] Toogood and Henderson, *Historic Structure Report,* 36.

1899

- Several entries from Grace Richards' diary describe activities associated with the fruit trees and orchards in 1899.
    - November 1, 1899: *Aut picking apples (grindstones). [American Pippin]."*
    - November 2, 1899: *"Aut went up to head of ditch in AM. Mr. C going as far as head of pipe—and picking "winter Nelis" sugar pears in door yard in PM."*
    - November 7, 1899:*"Aut & Fritz cleaning Jap walnuts in AM. In PM Fritz cleaning out ditch at head of pipe and in orchard near Shield's barn. Aut fixes road along vineyard fence and helps untarp lumber.*

Figure 2.7: The Camden family seated in the yard adjacent to the Camden House, n.d. Note lush vegetation in background, which was characteristic of the yard during this period (Whiskeytown NRA).

1900

- Several entries from Grace Richards' diary describe activities associated with the fruit trees and orchards in 1900.
    - February 1, 1900: *"Fred finished pruning peaches across ave. Aut planted another row onion sets, cleaned up around wood pile & fixed water trough at Mill."*
    - April 26, 1900: *"Jim taking stuff out of vineyard and weeding mission grapes. Aut in veg' garden."*

1902

- Camden noted, possibly in 1902, the locations of orchards and fruit species on the property.[38] These included:
    - *Field across the avenue: fifty-three apple trees and 100 peach trees.*
    - *Field back of the stage barn": ten apple trees.*
    - *Field back of the house: 210 apple trees and sixty pear trees.*
    - *Horse lot: ten apple trees and six peach trees.*
    - *Dooryard: twenty-five apple trees and ten pear trees.*
    - *Calf lot on the Mill road: twelve apple trees and six pear trees.*

Figure 2.8: Historic photograph showing Grace (left) and Figure 2.9: Mary (right) Camden amongst apple trees on the property (Whiskeytown NRA).

[38] National Park Service, Camden House Historic District Cultural Landscape Inventory, 2003, Part 2a, Page 11 of 21.

Ca. 1900-1920

- Philena Hubbard, who spent her childhood summers at the Camden house, provided a description of the house and the grounds as they appeared in the first decades of the twentieth century, circa 1900-1920.
    - *"Wild cherries grew along the banks of Willow Creek and Clear Creek. The yard included fig, apple, walnut, pie cherry and black tart cherry trees, as well as a large oak tree…"Nature's hay" – rye, meadow grass, and clover, interplanted with an apple orchard—filled the "back field." More apples, peaches, and pears grew in the orchard in the French Gulch field."*[39]

1912

- Charles Camden died in April 1912. Camden's daughter, Grace Richards, assumed ownership of the property.

1912-1935

- Frank Ponti agreed to prune and spray all of the fruit trees onsite under a lease agreement with Richards.[40]

Figure 2.10: Cherry trees in bloom near the woodshed on the property, n.d. (Whiskeytown NRA).

[39] Cultural Landscape Report, Part I for Tower House Historic District in the Whiskeytown Unit of the Whiskeytown-Shasta-Trinity National Recreation Area, Shasta County, California. Historical Research Associates, Inc., December 2001, page 27.
[40] National Park Service, Camden House Historic District Cultural Landscape Inventory, 2003, Part 2a, Page 16 of 21.

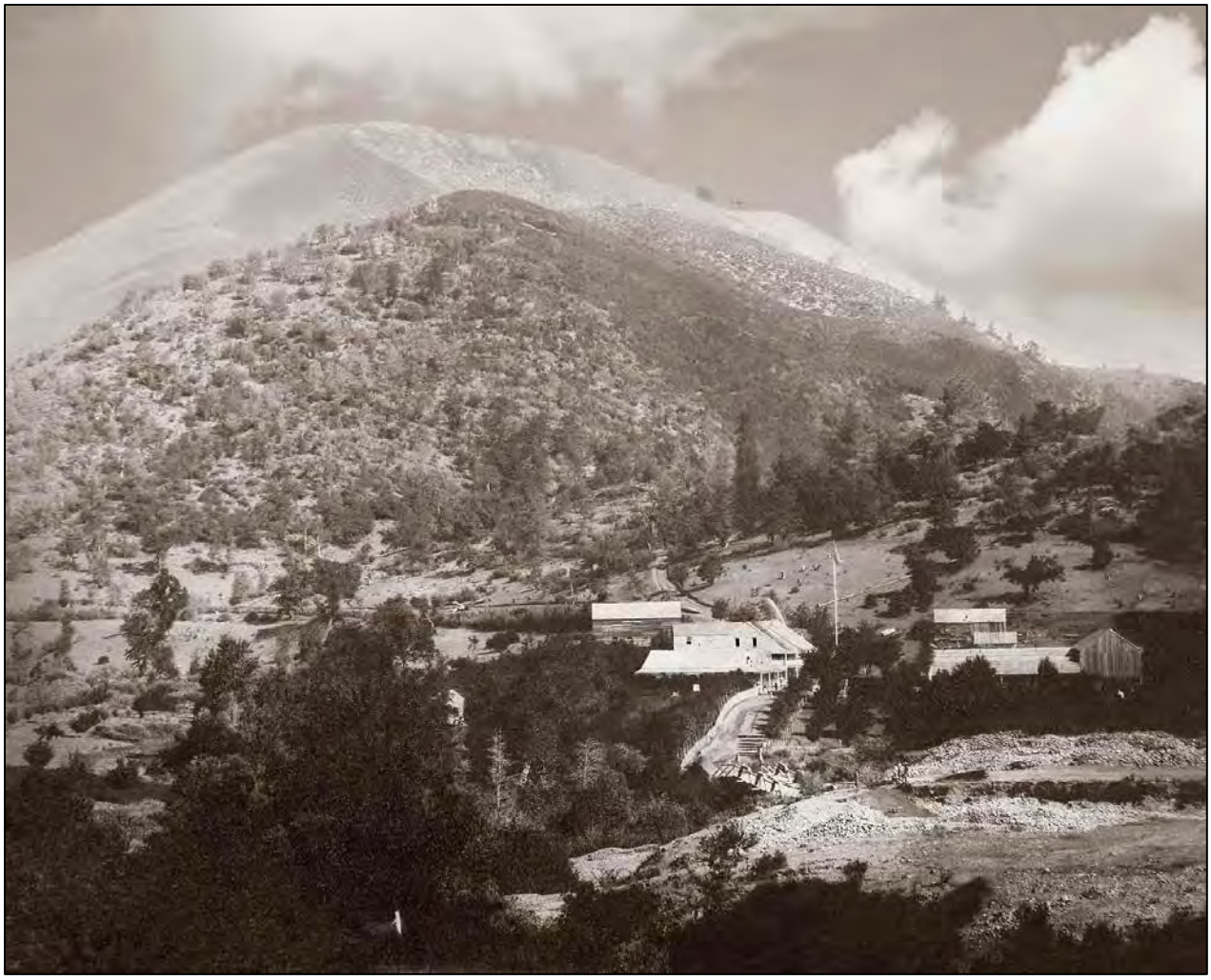


Figure 2.11: Historic photograph showing the Tower House and associated buildings and structures, n.d. Note toll road in front of the hotel with walnut tree allée and rows of fruit trees adjacent to the road (Whiskeytown NRA).

1919

- The Tower Hotel burned down in January 1919. Consequently, hotel operations ceased at the site.

1933

- Grace Richards died and as a result, ownership of the Camden House property was transferred to Philena Hubbard, Camden's granddaughter.

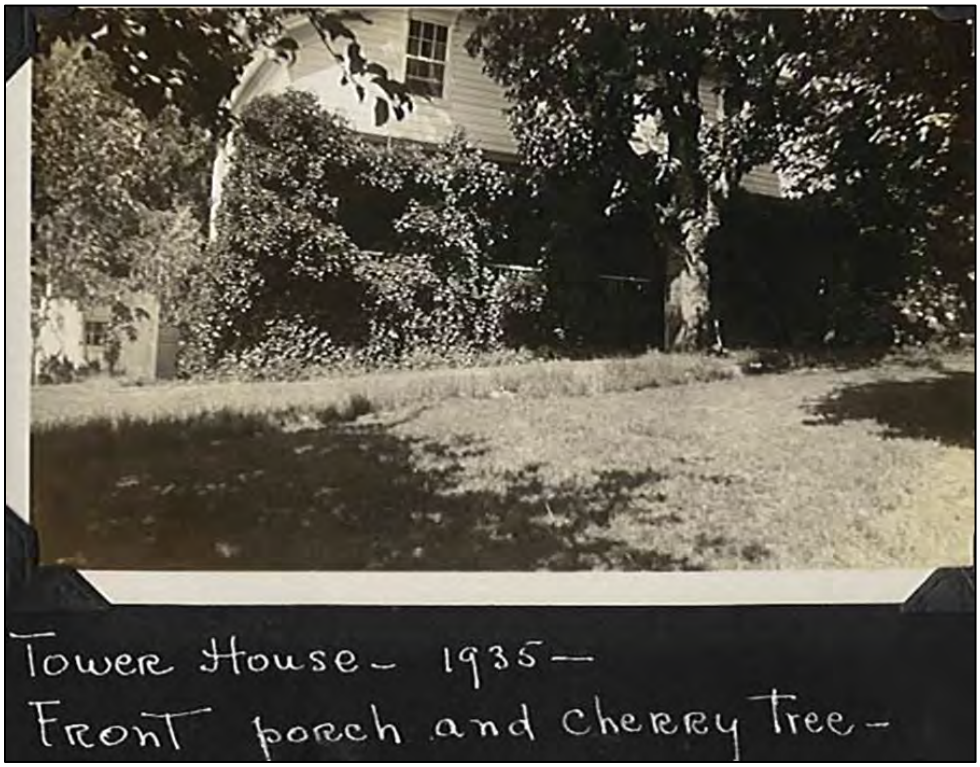


Figure 2.12: Historic photograph showing the front porch of the Camden House and an associated cherry tree, 1935 (Whiskeytown NRA).

Figure 2.13: Historic photograph of well-established trees in the French Gulch Field, 1935 (Whiskeytown NRA). The large size of the trees may suggest that they were walnut or cottonwood trees; however, it is possible that they were fruit trees.

1937

- Several entries from a Tower House journal describe activities associated with the fruit trees and orchards in 1937, including information regarding nurseries.

    - April 1, 1937: *"Herbert & I left Redlands on Tues – spending night at Merced – then on to Chico going to Grass Valley & Nevada City to see Felix Gillet Nursery & order nut trees (Butternut, Filberts, azaleas etc.)"*

    - April 8, 1937: *"Shipment from Armstrong Nursery came in fine condition – Rained hard all day long – Ed & H. planted 3 Lace Vines, 3 Filberts."*

    - April 21, 1937: *"Ordered 16 fruit trees for plot of ground other side of rose fence – opposite strawberry plants from Calif. Nursery Co. at Niles, Calif – Apples, Crab apples – nectarines – early white freestone peaches – Ed has been digging holes today to put trees in – May have trouble with Johnson grass there but thought cultivating might kill it, and good place for another orchard."*

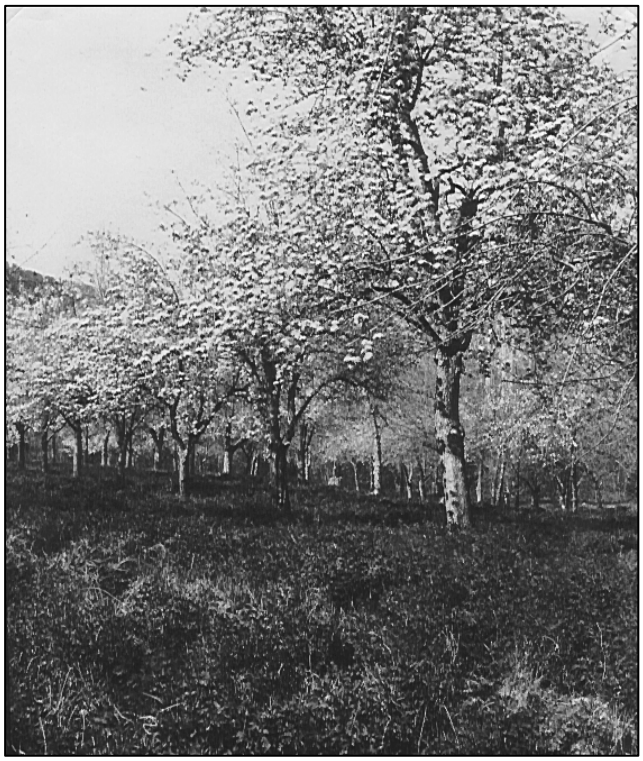
    - April 25, 1937: *"This A.M. Herbert and Ed planted the fruit trees that come yesterday – in piece of ground opposite strawberry patch, toward road – I had ordered 16 trees but they sent 20 – so had some to spare – Winter Banana apples, Nectarines, Jap. Plum – Early June apples & Jonathans – also Strawberry Peach and a new peach called "Nectar" & one crabapple and a sour pie cherry – Put crabapple down near old dahlia bed near pear tree which is covered with woodbine vine - & several of the extra apples up near old foundation of Tower House."*

    - April 28, 1937: *"More trees & shrubs arrive from Ohio – 4 Butternut & some Bitter Sweet – Will put nut trees down near raspberries where we planted 2 Butternuts from Gillett's Nursery (Nev. City) – These are much larger trees - & will plant Bittersweet next to one already plants – near kitchen window under apple tree."*

    - October 19, 1937: *"Found a few grapes, "Missions" – new the Barberry hedge – picked up a few Bartlett pears –and some apples for apple sauce."*

Ca. 1943

- A redwood water tank was constructed on the slope north of Highway 299.



Historic photos showing fruit trees in bloom on the property, n.d. Figure 2.14: The photo at the left shows cherry trees in bloom in front of the Camden House. Figure 2.15: The photo on the right illustrates an orchard in bloom (Whiskeytown NRA).

Figure 2.16: Historic and contemporary photographs (Figure 2.17) showing the vegetation and fence associated with the Tenant House, n.d. Note prominent snowball bushes (*Viburnum opulus*) in the Tenant House yard (Whiskeytown NRA).

1949

- As late as 1949, publications noted *"The Tower House was a great show place. The orchard the largest one north of Marysville. Some of the trees were brought around the Horn. Some of them are still standing."*[41]

1956

- Remaining walnut trees located along the allée that had been previously planted by Tower at an unknown date were cut down and sold to a gunsmith.

1969

- The National Park Service acquired the Camden House property and its associated buildings and structures for inclusion in Whiskeytown National Recreation Area.

1973

- The Historic Structure Report for the Tower House Historic District, prepared by Toogood in 1973, provided several recommendations for the orchards:
    - Summary of recommendations and specific treatment objectives for THHD orchards:

      1) Reestablishment of the orchard near Tower House site and back field orchard;

      2) Rehabilitation of irrigation system; and

      3) Reestablishment (long-range) of orchard across California 299, east of French Gulch Road [Trinity Mountain Road].[42]

    - Toogood also noted the following:

      "A portion of the orchard between the Camden House and the Tower House site should be reestablished." And "*The orchard should be partially reestablished in the meadow, with the lower part near the barn kept open for pasturing horses."*[43]

[41] Giles, 191.
[42] Toogood and Henderson, *Historic Structure Report,* 9.
[43] Ibid., 135.

- The Tower House Historic District was listed in the National Register of Historic Places. The nomination identified an *"old and extensive"* apple orchard located *"across the creek behind the Camden House"*. The nomination noted that the trees had not been cared for in many years and showed extensive signs of decay.[44]

Figure 2.18: Photograph of the Camden House showing extreme deterioration of the building, June 8, 1981 (Whiskeytown NRA).

1982

- The Interim Management Plan Tower House Historic District noted that most of the fruit trees onsite had died; however, several remained in the *"… field north of 299W, in the yard of the Camden House and in the back field across Willow Creek."*[45]

1985

- The Tower House Archeological District was listed on the National Register of Historic Places.

[44] Tower House District National Register of Historic Places nomination form, 1973.
[45] National Park Service, *Interim Management Plan Tower House Historic District, Whisketytown Unit, Whiskeytown-Shasta-Trinity National Recreation Area, California*, 1982, 9.

1999

- The GMP identified rehabilitation and/or restoration of the THHD cultural landscape, including the "*historic orchard and traditional/historic roads, trails, and irrigation systems.*" [46]

2003

- Orchard stabilization activities were initiated at the THHD through the collection of scion wood and deadwood removal.[47]

- Four orchard areas were noted as contributing features associated with vegetation in the cultural landscape. These included what was referred to as the: Back Field Orchard Remnants, Camden House Orchard Remnants, French Gulch Field Orchard Remnants and the Tenant House Orchard Remnants.

Figure 2.19: Panoramic photo showing remnant fruit trees associated with the French Gulch Field, 2003. Note thick patches of Himalayan blackberry in the foreground, which has since been removed by park staff with Cultural Cyclic Maintenance funds (PWR Cultural Landscapes Program).

2006

- The NPS undertook additional stabilization and preservation maintenance activities in the THHD. As part of these efforts, three clones from forty-six different trees were successfully grafted. Two scions of each tree were grafted to standard rootstock and containerized with the intent to be out-planted in approximately two to three years. One scion of each tree was grafted to dwarf rootstock to hasten production of fruit allowing earlier identification of variety. Approximately seventy percent of the clones succumbed to fireblight.[48]

[46] National Park Service, General Management Plan Whiskeytown Unit, Whiskeytown-Shasta-Trinity National Recreation Area, 1999, 13.
[47] National Park Service, Camden House Historic District Cultural Landscape Inventory, 2003, Part 1, Page 20 of 22.
[48] Project Management Information System (PMIS) #98558 "Complete Tower House Historic District Fruit Tree Stabilization Pruning and Genetic Conservation Phase 1" Component Completion Report, 2006.

2008

- An irrigation system was installed to provide water to the fruit trees associated with the fruit tree staging area or "nursery" located in the Camden House Yard. Cages were also constructed around the fruit trees to protect them from wildlife.[49]

- The Tower House Historic District Cultural Landscape Interim Treatment Report identified several district-wide and specific preservation management objectives associated with stabilization, preservation and rehabilitation activities associated with THHD historic fruit trees and orchards.

Figure 2.20: Photograph of the "octopus" apple tree located in the French Gulch Field, 2008 (PWR Cultural Landscapes Program).

2011

- The Whiskeytown NRA Harvest Festival was initiated. Activities included apple tastings, children's games, apple poetry, apple picking and Camden House tours. The event has been hosted on an annual basis since 2011.

[49] Project Management Information System (PMIS) #121260 "Stabilize Tower House Historic District Orchard to Enhance Cultural Landscape Interpretive Tours" Component Completion Report, 2008.

Ca. 2012

- The redwood tank located on the slope north of Highway 299 was reconstructed by the NPS.[50]

2013

- On July 21, 2013, the Bureau of Reclamation (BOR) ordered a 1600 CFS discharge of the Crystal Creek bypass. The event lasted eleven hours and discharged approximately 377 million gallons of water. The release flooded portions of Crystal Creek, Willow Creek, and Clear Creek and emptied into Whiskeytown Lake. Over an acre of woody debris and sediment was deposited in Clear Creek and Willow Creek, while the Crystal Creek Ditch was damaged.[51] As a consequence, water flowing to the redwood tank, which provided water to the fruit trees in the Camden House Yard has ceased, requiring park resource and maintenance staff to irrigate the fruit trees with a water tender during the summer months.

2014

- A total of 7.68 gross acres of Himalayan blackberry, tree of heaven, and black locust were removed from the THHD orchards.[52] As part of this effort, goats were used to manage vegetation and fuels within the THHD.

2015

- Preservation maintenance activities were undertaken on THHD orchards through cultural cyclic maintenance. Activities included pruning as well as the removal of encroaching exotic understory vegetation.

[50] Jason Church, "Restoration of the Camden House", NCPTT interview with Paul Cady and Rico Montenegro, September 17, 2013.
[51] National Park Service, "Crystal Creek Bypass Flood Damage Assessment for the July 21, 2013 Event", Whiskeytown National Recreation Area, July 27, 2013.
[52] Project Management Information System (PMIS) #198792 "Cultural Cyclic Maintenance of Tower House Historic District Orchards" Component Completion Report, 2014.

2016

- Goats were utilized to manage vegetation within the THHD, which supported the following objectives: to preserve the historic structures and cultural landscape; to more fully depict the character of the cultural landscape; to stabilize and preserve historic vegetation and stabilization and to preserve the historic views/visual relationships.

- Twenty-one leaf samples from fruit trees at the THHD were sent to the Foundation Plant Services laboratory at U.C. Davis to be genetically tested.

Figure 2.21: Goats grazing in the Tower House Historic District, 2016 (Whiskeytown NRA).

Repeat Photographs

Figure 2.22: Historic photograph of the site looking northwest, n.d. (Whiskeytown NRA).

Figure 2.23: Contemporary photograph of the site looking northwest, 2016 (PWR Cultural Landscapes Program).

Figure 2.24: Historic photograph showing the Tower House and French Gulch Field, looking, west, n.d. (Whiskeytown NRA).

Figure 2.25: Contemporary photograph showing the Tower House Historic District, 2016 (PWR Cultural Landscapes Program).

Figure 2.26: Historic photograph of the French Gulch Field looking southwest, n.d. (Whiskeytown NRA).

Figure 2.27: Contemporary photograph looking southwest from French Gulch Field, 2016 (PWR Cultural Landscapes Program).

Section Three: Existing Orchard Conditions

Figure 3.1: Photo looking northwest showing the Tower House Historic District, 2016 (PWR Cultural Landscapes Program).

Summary of All Tower House Historic District Orchard Areas

Size: 25 acres (combined acres of all THHD orchard areas)

Location: The four orchard locations included in the Interim Orchard Management are located within the Tower House Historic District at Whiskeytown National Recreation Area.

Total Number of Fruit and Nut Trees: 167 trees assessed

***Status:** Number of fruit or nut trees and their status: historic, non-historic and unknown for all orchard areas:

- Historic: 24% (40/167)
- Non-Historic: 32% (54/167)
- Unknown: 44% (73/167)

***Condition:** Number of fruit or nut trees in good, fair, poor, dead or undetermined condition for all orchard areas:

- Good: 12% (20/167)
- Fair: 25% (42/167)
- Poor: 46% (76/167)
- Dead: 13% (22/167)
- Undetermined: 4% (7/167)

*It is often necessary to make subjective judgements regarding the historic status of a tree. Whenever possible, photo documentation or other available evidence is used to identify the age and status of a tree, but in lieu of such evidence, a contemporary visual assessment by trained experts must suffice. Sometimes diagnostic tools such as increment borers are useful in deducing the age of a tree by counting annual rings, however; this technique is invasive and requires sufficiently sound wood to sample. More often than not, aged fruit trees have trunk cavities or decay that prevents a solid core sample.

Tree condition was determined by assessing the percent of live canopy present, presence or absence of visible stressors, and by evaluating the overall structural integrity of the tree. A good measure of tree health is measuring the relative length and biomass of new growth produced each year at the branch tips, which indicates the health of the roots and vascular system. These diagnostic techniques are employed to make a determination of tree condition.

Seven “undetermined” trees are extant in the Camden House Yard and were planted as part of a fruit tree nursery or holding area. During the 2016 PWR site visit, these trees had no tags, labels or other identifying information, and as a result were not assessed because their identities could not be confirmed or matched with previous records. Because they were not assessed for the purposes of this plan, their status was considered unknown and their condition undetermined.

Summary of Fruit Tree Status and Condition by Orchard Area

French Gulch Field (FG)

Fruit trees assessed: 29

Status:
- Historic: 14% (4/29)
- Non-Historic: 14% (4/29)
- Unknown:72% (21/29)

Condition:
- Good: 20% (6/29)
- Fair: 14% (4/29)
- Poor: 52% (15/29)
- Dead: 14% (4/29)

Camden House Yard (CY)

Fruit trees assessed: 59

Status:
- Historic: 20% (12/59)
- Non-Historic: 68% (40/59)
- Unknown: 12% (7/59)

Condition:
- Good: 13% (8/59)
- Fair: 29% (17/59)
- Poor: 22% (13/59)
- Dead: 24% (14/59)
- Undetermined: 12% (7/59)

Back Field (BF)

Fruit trees assessed: 37

Status:
- Historic: 51% (19/37)
- Non-Historic: 16% (6/37)
- Unknown: 33% (12/37)

Condition:
- Good: 8% (3/37)
- Fair: 27% (10/37)
- Poor: 57% (21/37)
- Dead: 8% (3/37)

Tenant House (TH)

Fruit trees assessed: 42

Status:
- Historic: 12% (5/42)
- Non-Historic: 10% (4/42)
- Unknown: 78% (33/42)

Condition:
- Good: 7% (3/42)
- Fair: 26% (11/42)
- Poor: 65% (27/42)
- Dead: 2% (1/42)

Stressors Common to All Orchard Areas

- Encroaching and/or overshading vegetation above tree canopy
- Overgrown groundcover around root zone
- Moss or lichen on tree
- Deadwood on trunks
- Encroaching vegetation around root zone
- Buried trunk flare
- Unbalanced canopy due to lost scaffold limbs on main trunk
- Suckering within root zone or at trunk base
- Leaning trunks
- Accumulated debris around root zone
- Cavities, cracks or splits at trunk base
- Gopher mounds around root zone
- Wildlife damage (sapsuckers, bear clawing and breakage)
- Soil accumulation at trunk base
- Watersprouts on trunks
- Cankers at trunk base

Figure 3.2: Sapsucker damage on the trunk of a fruit tree in the Back Field, 2016 (PWR Cultural Landscapes Program).

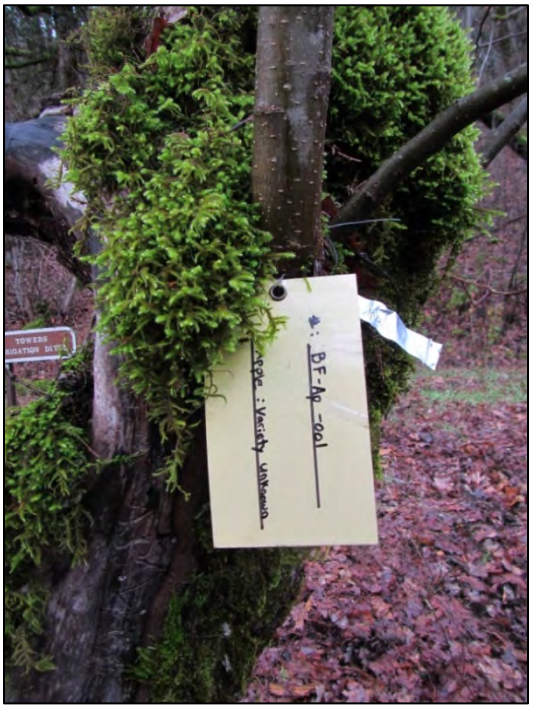
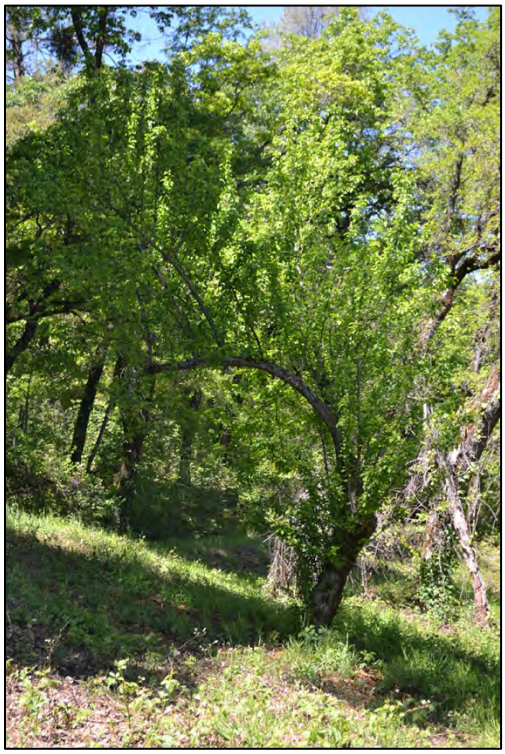


Figure 3.3: Growth of moss on a fruit tree in the Back Field, 2016 (PWR Cultural Landscapes Program).

Figure 3.4: Encroaching vegetation along the French Gulch Field fence line, 2016 (PWR Cultural Landscapes Program).

Figure 3.5: Overshading vegetation around the Tower Gravesite and Back Field apple trees, 2016 (PWR Cultural Landscapes Program).



Figures 3.6 and Figure 3.7: Unbalanced canopy/lost scaffold limbs on apple tree (left) and cherry tree (right), Back Field and French Gulch Field, 2016 (PWR Cultural Landscapes Program).

Figure 3.8: Leaning apple tree trunk, Back Field, 2016 (PWR Cultural Landscapes Program).

Figure 3.9: Watersprouts on an apple tree trunk, Back Field, 2016 (PWR Cultural Landscapes Program).

Figure 3.10: Root suckers, watersprouts, and buried trunk flare on apple tree, Tenant House, 2016 (PWR Cultural Landscapes Program).

Figures 3.11 and 3.12: Trunk split and cavity in apple trees, Back Field and Camden House Yard, 2016 (PWR Cultural Landscapes Program).

Figure 3.13: Exposed root of apple tree (left), French Gulch Field, 2016 (PWR Cultural Landscapes Program).

Figure 3.14: Bacterial canker/gummosis on cherry trunk, Back Field, 2016 (PWR Cultural Landscapes Program).

Figure 3.15: Encroaching vegetation around fruit tree trunk, French Gulch Field, 2016 (PWR Cultural Landscapes Program).

Figure 3.16: Black bear rubbing on trees, n.d. (Whiskeytown NRA).

Figure 3.17: Black bear in apple tree canopy in Yosemite National Park, 2016 (PWR Cultural Landscape

Interim Orchard Management Plan
Tower House Historic District - Orchard Overview | Existing Conditions Map

Pacific West Regional Office | Cultural Landscapes Program | 2016

Willow Creek
Upper Crystal Creek Ditch
Redwood Water Tank
Stone Masonry Spillway #2
Stone Masonry Spillway #1
Trinity Mountain Road
Highway 299
French Gulch Field (FG) Map
Stone Wall
Camden House Yard (CY) Map
Back Field (BF) Map
Lower Crystal Creek Ditch and Camden Water Ditch Trail
Levi Tower Grave Trail
Tenant House (TH) Map
Mill Creek

Legend
Map 3.1

- Historic District Boundary
- Orchard Boundaries
- Ditch
- Trail
- Creek
- Structure
- Apple (AP)
- Cherry (CH)
- Cherry Plum (CP)
- Crabapple (CA)
- Grape (GR)
- Pear (PR)
- Persimmon Grove (PS)
- Quince Grove (QU)
- Walnut (WA)

0 50 100 500 feet

French Gulch Field (FG)

Current Size: 5 acres

Location: The French Gulch Field is located in the Tower House Historic District within Whiskeytown National Recreation Area. The orchard is situated on the northeast side of Highway 299 and southwest of Trinity Mountain Road. The location is broadly defined by one large contiguous open field with a noticeable change in topography, which has been identified as the upper and lower terrace in this document.

Total Number of Extant Fruit Trees: 29 trees assessed

Tree Status: Number of fruit or nut trees and their status: historic, non-historic and unknown for French Gulch Field:

- Historic: 14% (4/29)
- Non-Historic: 14% (4/29)
- Unknown:72% (21/29)

Condition: Number of fruit or nut trees in good, fair, poor condition or dead for the French Gulch Field:

- Good: 20% (6/29)
- Fair: 14% (4/29)
- Poor: 52% (15/29)
- Dead: 14% (4/29)

Species Represented:

- Apple: 45% (13/29)
- Cherry: 10% (3/29)
- Grape: 4% (1/29)
- Pear: 4% (1/29)
- Quince: 4% (1/29)
- Walnut: 33% (10/29)

Major Tree Stressors in the French Gulch Field:

- Encroaching vegetation and accumulated debris within root zone
- Unbalanced scaffold limbs
- Trunk flare buried

Figure 3.18: Photo of the French Gulch Field looking northeast across Clear Creek toward Trinity Mountain Road, 2016 (PWR Cultural Landscapes Program).

Figure 3.19: Photograph of the "octopus" apple tree in the French Gulch Field, 2016 (PWR Cultural Landscapes Program).

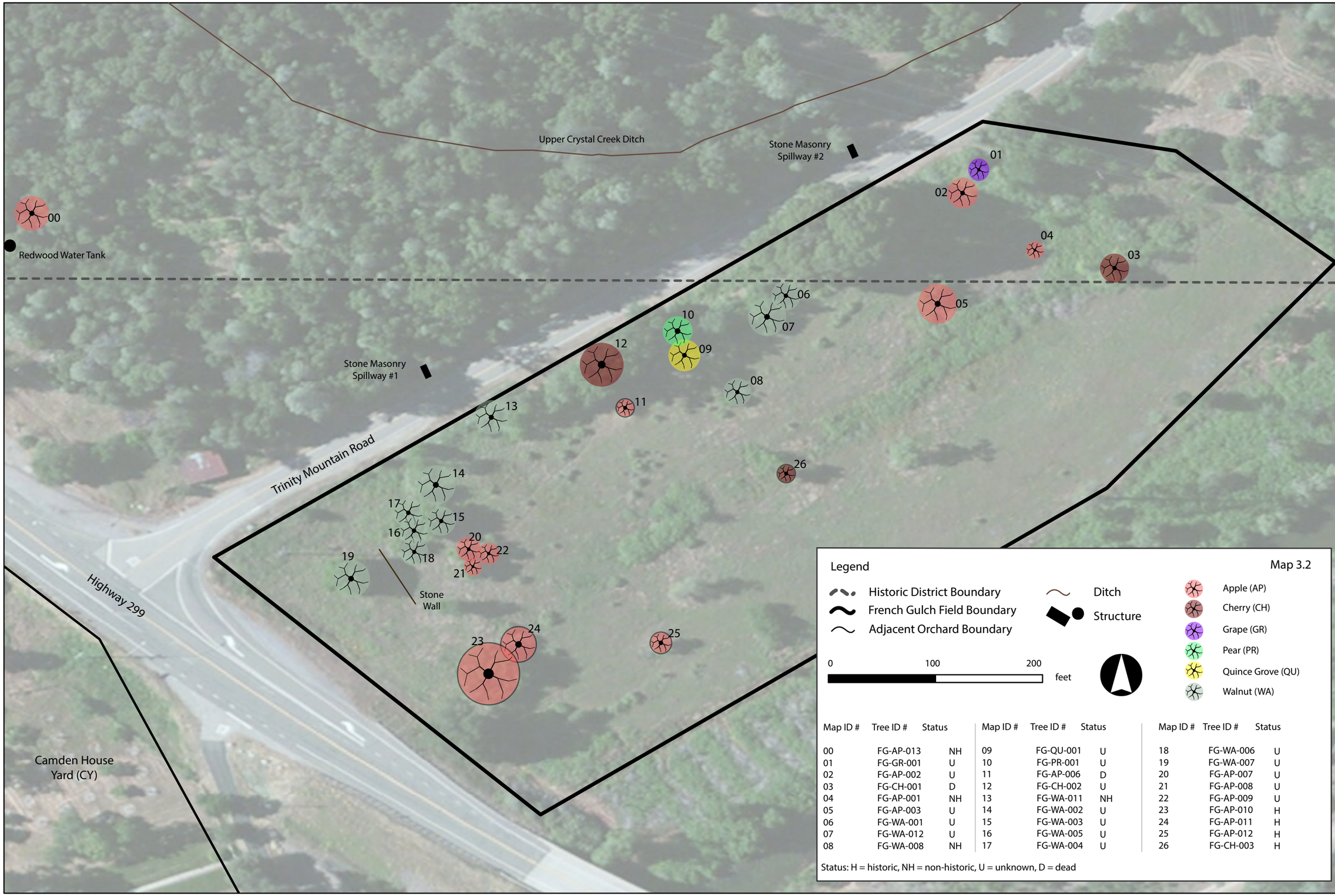
Table 3.1

General Information				Tree Botanical and Historical Information								Tree Condition in 2016	General Notes and Tree Work History
Date	Location	Old ID	New ID	Tree Type	Genus	Species	Cultivar/Variety	DBH	Historic	Non-Historic	Unknown		
2/5/2016	French Gulch (FG)	Anf1	FG-Ap-001	Apple	Malus	domestica	unknown	2.8		Non-Historic		Poor	Old dead trunk with watersprouts? Pruned 2013.
2/5/2016	French Gulch (FG)	Anf2	FG-Ap-002	Apple	Malus	domestica	unknown	5			Unknown	Fair	Seedling? Pruned 2013.
2/5/2016	French Gulch (FG)	5A	FG-Ap-003	Apple	Malus	domestica	unknown	7.2			Unknown	Poor	Described as possibly seedling from the 1940's. Pruned 2013.
2/4/2016	French Gulch (FG)	5B	FG-Ap-004	Apple	Malus	domestica						Dead	Described as possibly seedling from the 1940's. Pruned 2013. Removed as part of Runyon contract.
2/4/2016	French Gulch (FG)	5C	FG-Ap-005	Apple	Malus	domestica						Dead	Described as possibly seedling from the 1940's. Pruned 2013. Died 2014 after compost & mulch.
2/5/2016	French Gulch (FG)	10	FG-Ap-006	Apple	Malus	domestica	unknown	5.8				Dead	Pruned 2004, 2013.
2/5/2016	French Gulch (FG)	12A	FG-Ap-007	Apple	Malus	domestica	unknown	11.4			Unknown	Poor	Charlie Bull ID'd tree as 'Jonalicious' or 'Jonafree' but tree is too old for these cultivars. USDA returned no match in 2011. Tree affected by Diplodia fungal disease. Pruned 2004, 2013.
2/5/2016	French Gulch (FG)	12B	FG-Ap-008	Apple	Malus	domestica	unknown	14			Unknown	Poor	Pruned 2004, 2013. Charlie Bull ID'd as a Pippin. No such match in USDA database in 2011. Tree affected by Diplodia fungal disease.
2/5/2016	French Gulch (FG)	12C	FG-Ap-009	Apple	Malus	domestica	unknown	14			Unknown	Poor	Pruned 2004, 2013. Charlie Bull ID'd as a 'Jonafree'. No such match in USDA database in 2011. Tree affected by Diplodia fungal disease.
2/5/2016	French Gulch (FG)	1	FG-Ap-010	Apple	Malus	domestica	unknown	19	Historic			Fair	Possibly historic dating to 1850's. Pruned 2003, 2004, 2011, 2013. Ram Fishman ID'd tree as 'Golden Russet': no such match in USDA database in 2011.Two grafts planted in CY: multiple leaders 15-19" dbh.
2/5/2016	French Gulch (FG)	2	FG-Ap-011	Apple	Malus	domestica	unknown	10	Historic			Poor	Possibly historic dating to 1930's. Pruned 2003, 2004, 2011, 2013. Sent to USDA in 2011, no matching cultivars.
2/5/2016	French Gulch (FG)	3	FG-Ap-012	Apple	Malus	domestica	unknown	18	Historic			Poor	Possibly historic dating to 1880's. Pruned 2003, 2004, 2013. Bull & Fishman ID'd this as 'Daniels Jonalicious'. Samples sent to USDA in 2011 returned no match for this or any related cultivar. 'Daniels Jonalicious' not in USDA database, so
2/5/2016	Redwood water tank		FG-Ap-013	Apple	Malus		unknown	5.8		Non-Historic		Poor	Likely seedling growing on Clear Creek ditch bank near redwood water tank.
2/5/2016	French Gulch (FG)	Cuk	FG-Ch-001	Cherry	Prunus		unknown					Dead	Died in 2011. Seedling exists next to it.
2/5/2016	French Gulch (FG)	9	FG-Ch-002	Cherry	Prunus	avium	unknown	6			Unknown	Poor	Pruned 2013.
2/5/2016	French Gulch (FG)	9	FG-Ch-003	Cherry	Prunus		unknown	18	Historic			Poor	Pruned 2013.
2/5/2016	French Gulch (FG)		FG-Gr-001	Grape	Vitis		unknown	4.8			Unknown	Good	
2/5/2016	French Gulch (FG)	8	FG-Pr-001	Pear	Pyrus	communis	unknown	7			Unknown	Fair	Unknown age, probable seedling. Pruned 2013.
2/5/2016	French Gulch (FG)		FG-Qu-001	Quince	Cydonia	oblonga	unknown				Unknown	Fair	Unknown age of cluster, possibly historic. Large patch growing along inside of FG fence south of the big oak on Trinity Mtn. Road. Pruned 2013.
2/5/2016	French Gulch (FG)	6	FG-Wa-001	Walnut	Juglans	hindsii	Black Walnut				Unknown	Poor	Unknown age. Main trunk died. Multiple suckers at base.
2/5/2016	French Gulch (FG)	11A	FG-Wa-002	Walnut	Juglans	hindsii	Black walnut				Unknown	Poor	Unknown age. Multiple waterspouts from older stump.
2/5/2016	French Gulch (FG)	11B	FG-Wa-003	Walnut	Juglans	hindsii	Black walnut	10			Unknown	Good	Unknown age. 5 leaders 7-10" dbh from old stump.
2/5/2016	French Gulch (FG)	11C	FG-Wa-004	Walnut	Juglans	hindsii	Black walnut	2			Unknown	Poor	Unknown age. possibly historic.
2/4/2016	French Gulch (FG)	11D	FG-Wa-005	Walnut	Juglans	hindsii	Black walnut	16			Unknown	Good	Unknown age. Double leader 16" dbh at knee height.
2/5/2016	French Gulch (FG)	11E	FG-Wa-006	Walnut	Juglans	hindsii	Black walnut	6			Unknown	Poor	Unknown age. Multiple 6" dbh leaders from base.
2/5/2016	French Gulch (FG)	11F	FG-Wa-007	Walnut	Juglans	hindsii	Black walnut	9			Unknown	Good	Unknown age, possibly historic.
2/5/2016	French Gulch (FG)		FG-Wa-008	Walnut	Juglans		Black Walnut	5.8		Non-Historic		Good	
2/5/2016	French Gulch (FG)		FG-Wa-011	Walnut	Juglans		unknown	7		Non-Historic		Good	Age unknown, possible seedling.
2/5/2016	French Gulch (FG)		FG-Wa-012	Walnut	Juglans		Black Walnut				Unknown	Poor	Next to FG-Wa-001, multiple stems from base of old trunk, age unknown.

Note: trees FG-WA-009 and FG-WA-010 are not included in this list and account for the gap in the numbering system in the table above. These two trees were previously identified as orchard trees but upon inspection turned out to be locust trees.

Interim Orchard Management Plan
Tower House Historic District - French Gulch Field (FG) | Existing Conditions Map

Pacific West Regional Office | Cultural Landscapes Program | 2016



Legend

Map 3.2

- Historic District Boundary
- French Gulch Field Boundary
- Adjacent Orchard Boundary
- Ditch
- Structure
- Apple (AP)
- Cherry (CH)
- Grape (GR)
- Pear (PR)
- Quince Grove (QU)
- Walnut (WA)

0 100 200 feet

Map ID #	Tree ID #	Status
00	FG-AP-013	NH
01	FG-GR-001	U
02	FG-AP-002	U
03	FG-CH-001	D
04	FG-AP-001	NH
05	FG-AP-003	U
06	FG-WA-001	U
07	FG-WA-012	U
08	FG-WA-008	NH
09	FG-QU-001	U
10	FG-PR-001	U
11	FG-AP-006	D
12	FG-CH-002	U
13	FG-WA-011	NH
14	FG-WA-002	U
15	FG-WA-003	U
16	FG-WA-005	U
17	FG-WA-004	U
18	FG-WA-006	U
19	FG-WA-007	U
20	FG-AP-007	U
21	FG-AP-008	U
22	FG-AP-009	U
23	FG-AP-010	H
24	FG-AP-011	H
25	FG-AP-012	H
26	FG-CH-003	H

Status: H = historic, NH = non-historic, U = unknown, D = dead

Camden House Yard (CY)

Current Size: 4.5 acres

Location: The Camden House Yard is located in the Tower House Historic District within Whiskeytown National Recreation Area, southwest of Highway 299. The location includes the yard associated with the Camden House as well a segment of the Tower Grounds situated northwest of the Camden House.

Total Number of Extant Fruit Trees: 59 trees assessed

Status: Number of fruit or nut trees and their status: historic, non-historic and unknown for the Camden House Yard:

- Historic: 20% (12/59)
- Non-Historic: 68% (40/59)
- Unknown: 12% (7/59)

Condition: Number of fruit or nut trees in good, fair, poor and undetermined condition or dead for the Camden House Yard:

- Good: 13% (8/59)
- Fair: 29% (17/59)
- Poor: 22% (13/59)
- Dead: 24% (14/59)
- Undetermined: 12% (7/59)

Species Represented:

- Apple: 80% (47/59)
- Cherry: 3% (2/59)
- Grape: 2% (1/59)
- Pear: 13% (8/59)
- Walnut: 2% (1/59)

Major Tree Stressors in Camden House Yard:

- Gopher mounds within root zone
- Unbalanced scaffold limbs
- Moss or lichen in trees
- Bear damage

Figure 3.20: Camden House Yard looking southeast, 2014 (PWR Cultural Landscapes Program).

Figure 3.21: Camden House with walnut tree at left, 2016 (PWR Cultural Landscapes Program).

Table 3.2

General Information				Tree Botanical and Historical Information								Tree Condition	General Notes and Tree Work History
Date	Location	Old ID	New ID	Tree Type	Genus	Species	Cultivar/Variety	DBH	Historic	Non-Historic	Unknown		
2/5/2016	Camden Yard (CY)	Ap6	CY-Ap-001	Apple	Malus	domestica	unknown	4.2		Non-Historic		Poor	Pruned 2010, 2014. Probably a seedling about 30 years old, per R. Montenegro.
2/5/2016	Camden Yard (CY)	Ap1	CY-Ap-002	Apple	Malus	domestica	unknown	9.4		Non-Historic		Poor	Pruned 2010, 2014. Probably a seedling about 30 years old, per R. Montenegro.
2/5/2016	Camden Yard (CY)	Ap2	CY-Ap-003	Apple	Malus	domestica	unknown	7.2		Non-Historic		Poor	Pruned 2010, 2014. Probably a seedling about 30 years old, per R. Montenegro. Sent to USDA in 2011 for id: no match in USDA database.
2/5/2016	Camden Yard (CY)	Ap5	CY-Ap-004	Apple	Malus	domestica	unknown	6.2		Non-Historic		Poor	Pruned 2010, 2014. Probably a seedling about 25-30 years old, per R. Montenegro.
2/4/2016	Camden Yard (CY)	26	CY-Ap-007	Apple	Malus	domestica						Dead	Pruned 2010, 2014. Died in Fall 2013(?). Probably 150 years old, per R. Montenegro. Sent to USDA in 2011: no match in USDA database.
2/5/2016	Camden Yard (CY)	25	CY-Ap-008	Apple	Malus	domestica	'Derman Winesap'	11	Historic			Fair	Pruned 2003, 2004, 2010, 2014. Probably 100 years old, per R. Montenegro. Sent to USDA in 2011: was thought to be 'York Imperial', USDA id'd as 'Derman Winesap'Current trunk is water sprout from fallen original trunk.
2/5/2016	Camden Yard (CY)	29	CY-Ap-009	Apple	Malus	domestica	unknown	13		Non-Historic		Poor	Pruned 2003, 2004, 2010, 2014. Possibly a 40 year old seedling, per R. Montenegro. Sent to USDA in 2011: no match in USDA database.
2/5/2016	Camden Yard (CY)	Ap7	CY-Ap-010	Apple	Malus	domestica	unknown	7		Non-Historic		Poor	Pruned 2010, 2014. Probably a 30 year old seedling, per R. Montenegro.
2/5/2016	Camden Yard (CY)	24	CY-Ap-011	Apple	Malus	domestica	'Collamer Twenty Ounce'	24	Historic			Fair	Pruned 2003, 2004, 2010, 2014. Probably a 150 years old, per R. Montenegro. Ram Fishman id'd as 'Red Bietgheimer'. Sent to USDA in 2011: genetically id'd as 'Collamer Twenty Ounce'.
2/5/2016	Camden Yard (CY)	30	CY-Ap-012	Apple	Malus	domestica	unknown	29	Historic			Fair	Pruned 2003, 2004, 2010, 2014. Probably a 150 years old, per R. Montenegro. Sent to USDA in 2011: was thought to be 'Baldwin' but sample did not match that or similar cultivars in USDA database.
2/4/2016	Camden Yard (CY)	21	CY-Ap-013	Apple	Malus	domestica	'Jonathan' or related cultivar	18.6			Unknown	Fair	Pruned 2003, 2004, 2010, 2011, 2014. Possibly historic from 1930's, per R. Montenegro. Grafted scions planted in Camden House yard. Sent to USDA in 2011: Ram Fishman id'd as 'Rosebrook Gravenstein'; USDA id'd it as 'Jonathan' or similar genetic relative.
2/4/2016	Camden Yard (CY)	22B	CY-Ap-014	Apple	Malus	domestica	unknown	16.4	Historic			Poor	Pruned 2003, 2004, 2010, 2011, 2014. Possibly 100 years old, per R. Montenegro. Charlie Bull & Ram Fishman id'd as 'Jonalicious', but tree is too old to be that. Sent to USDA in 2011: no match but is identical to tree CY-Ap-015.
2/4/2016	Camden Yard (CY)	22A	CY-Ap-015	Apple	Malus	domestica	unknown	17	Historic			Poor	Pruned 2003, 2004, 2010, 2011, 2014. Probably 130 years old, per R. Montenegro. Charlie Bull & Ram Fishman id'd as 'Jonalicious', but tree is too old to be that. Sent to USDA in 2011: no match but is identical to tree CY-Ap-014. Grafted scions planted in Camden House yard.

Table 3.2

2/4/2016	Camden Yard (CY)	20	CY-Ap-016	Apple	Malus	domestica	'White Winter Pearmain'	7			Unknown	Poor	Pruned 2003, 2004, 2010, 2011, 2014. Possibly historic, probably 100 years old, per R. Montenegro. Ram Fishman id'd as 'Winter Banana'. Sent to USDA and sample matched 'White Winter Pearmain' in USDA database. Grafted scions planted in Camden House yard.
2/5/2016	Camden Yard (CY)	19	CY-Ap-017	Apple	Malus	domestica	unknown	15.6	Historic			Fair	Pruned 2003, 2004, 2010, 2011, 2014. Probably 80 years old, per R. Montenegro. Sent to USDA in 2011: thought to be 'Carolina Red June' but did not match in the USDA database, but genetically matched tree Cy-Ap-018. Grafted scions planted in Camden House yard.
2/4/2016	Camden Yard (CY)	18	CY-Ap-018	Apple	Malus	domestica	unknown	12.6	Historic			Fair	Pruned 2003, 2004, 2010, 2011, 2014. Possibly historic, probably 80 years old, per R. Montenegro. Sent to USDA in 2011: thought to be 'Carolina Red June' but did not match in the USDA database, but genetically matched tree Cy-Ap-017.
2/4/2016	Camden Yard (CY)	17	CY-Ap-019	Apple	Malus	domestica	Lady	21.2	Historic			Fair	
2/4/2016	Camden Yard (CY)	13	CY-Ap-020	Apple	Malus	domestica	unknown	15.6	Historic			Poor	Pruned 2003, 2004, 2010, 2011, 2014. Probably 130 years old, per R. Montenegro. Sent to USDA in 2011: no matches in USDA database. Old spreadsheet id'd as 'Bullock' or 'Sheepnose'. Apparently 'Golden Russets' were aka 'Sheepnose' or 'Bullock's Pippin'. Grafted scions planted in Camden House yard.
2/4/2016	Camden Yard (CY)	30DS	CY-Ap-021	Apple	Malus	domestica	unknown			Non-Historic		Dead	Dead: Propagated from tree BF-Ap-020.
2/4/2016	Camden Yard (CY)	22DS	CY-Ap-022	Apple	Malus	domestica				Non-Historic		unknown	Propagated from tree TH-Ap-013, id'd as 'Rhode Island Greening'.
2/4/2016	Camden Yard (CY)	29D	CY-Ap-023	Apple	Malus	domestica	'Spitzenberg'			Non-Historic		Dead	Propagated from tree TH-Ap-011, id'd as 'Spitzenburg' by Ram Fishman.
2/4/2016	Camden Yard (CY)	28Ds	CY-Ap-024	Apple	Malus	domestica	unknown			Non-Historic		Dead	Propagated from tree TH-Ap-004, which died in 2014.
2/5/2016	Camden Yard (CY)	20Ds	CY-Ap-025	Apple	Malus	domestica	unknown			Non-Historic		unknown	Propagated from tree TH-Ap-001, id'd as 'Reinette Fanche'.
2/4/2016	Camden Yard (CY)	27A	CY-Ap-026	Apple	Malus	domestica	unknown	2.2		Non-Historic		Good	Propagated from tree BF-Ap-002.
2/4/2016	Camden Yard (CY)	19As	CY-Ap-027	Apple	Malus	domestica	unknown	1.8		Non-Historic		Fair	Propagated from tree BF-Ap-008, id'd as 'Baldwin'.
2/4/2016	Camden Yard (CY)	26D	CY-Ap-028	Apple	Malus	domestica	unknown			Non-Historic		Dead	Propagated from tree BF-Ap-002.
2/4/2016	Camden Yard (CY)	18A	CY-Ap-029	Apple	Malus	domestica	unknown	4.4		Non-Historic		Good	Propagated from tree BF-Ap-019, id'd as 'York Imperial'.
2/4/2016	Camden Yard (CY)	11D	CY-Ap-030	Apple	Malus	domestica				Non-Historic		unknown	Propagated from tree CY-Ap-013, id'd as 'Jonathan' or related cultivar.
2/4/2016	Camden Yard (CY)	25A	CY-Ap-031	Apple	Malus	domestica				Non-Historic		unknown	Propagated from tree BF-Ap-005, id'd as 'American Summer Pearmain'.
2/4/2016	Camden Yard (CY)	17A	CY-Ap-032	Apple	Malus	domestica	unknown	2.8		Non-Historic		Fair	Propagated from tree BF-Ap-020. Fruit is described as "soft, grainy and gross".
2/4/2016	Camden Yard (CY)	10A	CY-Ap-033	Apple	Malus	domestica	unknown	4.8		Non-Historic		Good	Propagated from tree CY-Ap-017.
2/4/2016	Camden Yard (CY)	24D	CY-Ap-034	Apple	Malus	domestica				Non-Historic		unknown	Propagated from tree BF-Ap-006, id'd as 'Duchess of Oldenburg'.
2/4/2016	Camden Yard (CY)	14A	CY-Ap-035	Apple	Malus	domestica						Dead	Propagated from tree CY-Ap-009. missing, dead.
2/4/2016	Camden Yard (CY)	9A	CY-Ap-036	Apple	Malus	domestica	unknown			Non-Historic		unknown	Propagated from tree FG-Ap-009.
2/4/2016	Camden Yard (CY)	13A	CY-Ap-037	Apple	Malus	domestica	unknown	2.8		Non-Historic		Good	Propagated from tree 23 (old naming system, no New ID), original tree died in 2004.
2/4/2016	Camden Yard (CY)	23A	CY-Ap-038	Apple	Malus	domestica				Non-Historic		unknown	Propagated from tree BF-Ap-007, id'd as 'Sheepnose'.
2/4/2016	Camden Yard (CY)	8A	CY-Ap-039	Apple	Malus	domestica	unknown	1.8		Non-Historic		Fair	Propagated from tree CY-Ap-020, possibly 'Bullock', 'Sheepnose' or 'Golden Russet'.
2/4/2016	Camden Yard (CY)	5Ds	CY-Ap-040	Apple	Malus	domestica	unknown			Non-Historic		Dead	Propagated from tree CY-Ap-041, which itself was propagated from tree CY-Ap-015.

Table 3.2

2/4/2016	Camden Yard (CY)	12A	CY-Ap-041	Apple	Malus	domestica	unknown	2.2		Non-Historic		Fair	Propagated from tree CY-Ap-015. Parent tree id'd as 'Jonalicious', but parent tree too old to be 'Jonalicious'.
2/4/2016	Camden Yard (CY)	3As	CY-Ap-042	Apple	Malus	domestica	unknown			Non-Historic		Dead	Propagated from parent tree FG-Ap-012. Parent tree id'd by Bull & Fishman as 'Daniel's Jonalicious', but USDA results show no match for 'Jonalicious'.
2/4/2016	Camden Yard (CY)	3As	CY-Ap-043	Apple	Malus	domestica	unknown			Non-Historic		Dead	"No clue" as to the parent tree of this scion.
2/4/2016	Camden Yard (CY)	2Ds	CY-Ap-044	Apple	Malus	domestica	unknown			Non-Historic		Dead	Dead with sprouts as of 2010. (rootstock or watersprouts?) Propagated from tree FG-Ap-11: no cultivar match in USDA database.
2/4/2016	Camden Yard (CY)	6A	CY-Ap-045	Apple	Malus	domestica	unknown	1.2		Non-Historic		Good	Propagated from tree "12A (old ID) which is either CY-Ap-041 or FG-Ap-07 (both listed as former ID 1A on spreadsheet). Both ID'd by C. Bull as 'Jonalicious' or 'Jonafree' but parent tree is too old to be Jonalicious, and no genetic match in USDA database.
2/4/2016	Camden Yard (CY)	4A	CY-Ap-046	Apple	Malus	domestica	unknown					Dead	Propagated from tree FG-Ap-010, R. Fishman ID'd as 'Golden Russet' but does not match in USDA database. removed. Died: No longer here.
2/4/2016	Camden Yard (CY)	1A	CY-Ap-047	Apple	Malus	domestica	unknown	2.2		Non-Historic		Fair	Propagated from tree FG-Ap-010, R. Fishman ID'd as 'Golden Russet' but does not match in USDA database.
2/4/2016	Camden Yard (CY)	15A	CY-Ap*-048	Apple	Malus	domestica	unknown	2.8		Non-Historic		Good	Propagated from tree "70" aka TH-Ch-002, ID'd on old spreadsheet as a cherry but this grafted scion is an unknown apple. New spreadsheet still retains the Ch designation in the trinomial, and other grafted cherry scions ID "70" as the parent... Possibly CY-Ap-048 was taken from another apple tree, or else misidentified here?
2/5/2016	Camden Yard (CY)		CY-Ap-049	Apple	Malus	domestica	unknown	2.8		Non-Historic		Fair	A chance seedling next to tree CY-Ap-007. This tree was never mapped or labeled.
2/5/2016	Camden Yard (CY)	Cherry 1	CY-Ch-001	Cherry	Prunus		unknown	12.6		Non-Historic		Poor	Pruned 2014. Probably 25 years old, per R. Montenegro.
2/4/2016	Camden Yard (CY)	16Ds	CY-Ch-002	Sweet Cherry	Prunus	avium				Non-Historic		Dead	Propagated from tree TH-Ch-002.
2/4/2016	Camden Yard (CY)		CY-Gr-001	Grape	Vitis		unknown	5			Unknown	Good	Discovered in 2016, possibly native grape.
2/5/2016	Camden Yard (CY)	BP1	CY-Pr-001	Pear	Pyrus	communis	unknown				Unknown	Poor	Probably 75 years old per R. Montenegro. Pruned 2010, 2014.
2/5/2016	Camden Yard (CY)	PC	CY-Pr-002	Pear	Pyrus	communis	unknown	8	Historic			Fair	Probably 100 - 130 years old per R. Montenegro. Pruned 2014. double leaders, 8 dbh
2/4/2016	Camden Yard (CY)	14	CY-Pr-003	Pear	Pyrus	communis	'Bartlett'?	19	Historic			Fair	Possibly historic from 1880's, but only 50 years old per R. Montenegro. Pruned 2014.
2/5/2016	Camden Yard (CY)	21Ds	CY-Pr-004	Pear	Pyrus	communis				Non-Historic		Dead	Propagated from TH-Pr-001, described as 50-60 year-old seedling.
2/5/2016	Camden Yard (CY)	Ap4	CY-Pr-005	Pear	Pyrus	communis	unknown	5.4		Non-Historic		Poor	Discovered to be a pear in 2012. Probably 25 years old per R. Montenegro. Pruned 2010, 2014.
2/5/2016	Camden Yard (CY)	Ap3	CY-Pr-006	Pear	Pyrus	communis	unknown	5.6		Non-Historic		Fair	Discovered to be a pear in 2012. Probably 25 years old per R. Montenegro. Pruned 2010, 2014.
2/4/2016	Camden Yard (CY)	P2	CY-Pr-007	Pear	Pyrus	communis	unknown	12		Non-Historic		Fair	Discovered to be a pear in 2012. Probably 25 years old per R. Montenegro. Pruned 2014.
2/5/2016	Camden Yard (CY)	P1	CY-Pr-008	Pear	Pyrus	communis	unknown	8		Non-Historic		Dead	Discovered to be a pear in 2012. Probably 75 years old per R. Montenegro. Infected with some sort of fungus, cut down to resprouts in 2014. stump with sucker growth, 2016
2/4/2016	Camden Yard (CY)	16	CY-Wa-001	Walnut	Juglans		unknown		Historic			Good	Age unknown, possibly historic from 1900's.

Interim Orchard Management Plan
Tower House Historic District - Camden House Yard (CY) | Existing Conditions Map

Pacific West Regional Office | Cultural Landscapes Program | 2016

Map 3.3

Legend

- Historic District Boundary
- Camden House Yard Boundary
- Adjacent Orchard Boundary
- Trail
- Creek
- Structure

- Apple (AP)
- Cherry (CH)
- Grape (GR)
- Pear (PR)
- Walnut (WA)

Map ID #	Tree ID #	Status
00	CY-AP-020	H
01	CY-PR-003	H
02	CY-WA-001	H
03	CY-AP-019	H
04	CY-AP-048	NH
05	CY-AP-041	NH
06	CY-AP-045	NH
07	CY-AP-046	D
08	CY-AP-047	NH
09	CY-AP-018	H
10	CY-AP-017	H
11	CY-AP-039	NH
12	CY-AP-037	NH
13	CY-AP-032	NH
14	CY-AP-035	D
15	CY-AP-016	U
16	CY-AP-013	U
17	CY-AP-033	NH
18	CY-AP-029	NH
19	CY-AP-026	NH
20	CY-AP-027	NH
21	CY-AP-015	H
22	CY-AP-014	H
23	CY-GR-001	U
24	CY-AP-012	H
25	CY-PR-002	H
26	CY-AP-010	NH
27	CY-PR-001	U
28	CY-AP-009	NH
29	CY-PR-007	NH
30	CY-PR-008	NH
31	CY-PR-006	NH
32	CY-AP-004	NH
33	CY-AP-003	NH
34	CY-AP-002	NH
35	CY-AP-001	NH
36	CY-CH-001	NH
37	CY-AP-049	NH
38	CY-AP-008	H
39	CY-AP-011	H
40	CY-PR-005	NH

Status: H = historic, NH = non-historic, U = unknown, D = dead

0 100 200 feet

Willow Creek

Lower Crystal Creek Ditch & Camden Water Ditch Trail

Back Field

Levi Tower Grave Trail

Highway 299

Trinity Mountain Road

Stone Masonry Spillway #1

French Gulch Field (FG)

Nursery

Back Field (BF)

Current Size: 6.5 acres

Location: The Back Field is located in the Tower House Historic District within Whiskeytown National Recreation Area. The relatively flat linear field is situated at the confluence of Clear Creek and Mill Creek. More specifically, the orchard is located east of Willow Creek, west of Mill Creek, and south of the Tower Gravesite.

Total Number of Extant Fruit Trees: 37 trees assessed

Status: Number of fruit or nut trees and their status: historic, non-historic and unknown for the Back Field:

- Historic: 51% (19/37)
- Non-Historic: 16% (6/37)
- Unknown: 33% (12/37)

Condition: Number of fruit or nut trees in good, fair and poor condition or dead for the Back Field:

- Good: 8% (3/37)
- Fair: 27% (10/37)
- Poor: 57% (21/37)
- Dead: 8% (3/37)

Species Represented:

- Apple: 67% (25/37)
- Cherry: 16% (6/37)
- Pear: 14% (5/37)
- Persimmon: 3% (1/37)

Major Tree Stressors in the Back Field:

- Overshading foliage and encroaching overhead vegetation
- Root suckers at trunk base
- Moss and lichen on tree
- Watersprouts on trunk
- Accumulated debris
- Buried root flare
- Bear damage

Figure 3.22: Photo looking southeast of a fruit tree in the Back Field, 2016 (PWR Cultural Landscapes Program).

Figure 3.23: Photo showing the Camden Water Ditch Trail in the foreground with fruit trees associated with the Back Field on left, 2016 (PWR Cultural Landscapes Program).

Table 3.3

General Information				Tree Botanical and Historical Information								Tree Condition in 2016	General Notes and Tree Work History
Date	Location	Old ID	New ID	Tree Type	Genus	Species	Cultivar/Variety	DBH	Historic	Non-Historic	Unknown		
2/4/2016	Back Field (BF)	42B	BF-Ap-001	Apple	Malus	domestica	unknown	17	Historic			Poor	Likely historic, age unknown. Pruned in 2003, 2012, 2015. Germplasm sent to USDA in 2011: no match in USDA database, but genetically identical to BF-AP-002. Grafted scions planted in Camden House Yard.
2/4/2016	Back Field (BF)	42A	BF-Ap-002	Apple	Malus	domestica	unknown	17.6	Historic			Poor	Likely historic, possibly from late 1800's per R. Montenegro. Pruned in 2012, 2015. Germplasm sent to USDA in 2011: no match in USDA database, but genetically identical to BF-AP-001. Grafted scions planted in Camden House Yard.
2/4/2016	Back Field (BF)	39A	BF-Ap-003	Apple	Malus	domestica	No cultivar match in 2016 but matches BF-Ap-006 and 007	15.2	Historic			Poor	Likely historic, possibly from 1890's per R. Montenegro. Pruned in 2003, 2011, 2012, 2015. Grafted scions planted in Camden House Yard. Trunk half fallen over. Genetic testing in 2016 revealed no cultivar match, but this tree is identical to BF-Ap-006 and 007.
2/4/2016	Back Field (BF)	39B	BF-Ap-003b	Apple	Malus	domestica	American Summer Pearmain'?		Historic			Poor	Likely historic, possibly from 1890's per R. Montenegro. Pruned in 2003, 2012. Need to double check on cultivar. Grafted scion planted in Camden House yard.
2/4/2016	Back Field (BF)	41	BF-Ap-004	Apple	Malus	domestica	No cultivar match in 2016	5.8	Historic			Poor	Likely historic, age unknown. Pruned in 2011, 2012, 2015. Identified by Ram Fishman. Miscatalogued as "summer rainbow" in old spreadsheet. Genetic testing in 2016 revealed no cultivar match.
2/4/2016	Back Field (BF)	38	BF-Ap-006	Apple	Malus	domestica	No cultivar match in 2016 but matches BF-Ap-003 and 007	15.4	Historic			Poor	Likely historic, possibly from 1890's per R. Montenegro. Pruned in 2003, 2011, 2012, 2015. Grafted scion planted in Camden House yard. Genetic testing in 2016 revealed no cultivar match, but this tree is identical to BF-Ap-006 and 007.
2/4/2016	Back Field (BF)	37	BF-Ap-007	Apple	Malus	domestica	No cultivar match in 2016 but matches BF-Ap-003 and 006	14.2	Historic			Poor	Likely historic, possibly from 1890's per R. Montenegro. Pruned in 2003, 2011, 2012. Grafted scions planted in Camden House yard. Genetic testing in 2016 revealed no cultivar match, but this tree is identical to BF-Ap-006 and 007.
2/4/2016	Back Field (BF)	36	BF-Ap-008	Apple	Malus	domestica	Colby Baldwin	25	Historic			Poor	Likely historic, age unknown. Pruned in 2003, 2012. Ram Fishman id'd. Grafted scions planted in Camden House yard. Positive cultivar ID from 2016 testing.
2/4/2016	Back Field (BF)	45	BF-Ap-009	Apple	Malus	domestica	No cultivar match in 2016	12.4	Historic			Poor	Likely historic, age unknown. Pruned in 2012. Ram Fishman id'd. Germplasm sent to USDA in 2011: no match in USDA database. Grafted scions planted in Camden House yard. Testing revealed no cultvar ID in 2016.
2/4/2016	Back Field (BF)	47	BF-Ap-010	Apple	Malus	domestica	Winesap	16	Historic			Poor	Likely historic, age unknown. Pruned in 2012. ID confirmed in 2016 testing.
2/4/2016	Back Field (BF)	46	BF-Ap-011	Apple	Malus	domestica	No cultivar match in 2016	19.2	Historic			Poor	Likely historic, age unknown. Pruned in 2012. Testing revealed no cultvar ID in 2016.
2/4/2016	Back Field (BF)	49	BF-Ap-012	Apple	Malus	domestica	No cultivar match in 2016	8			Unknown	Poor	Possibly historic, age unknown. Pruned in 2012. Testing revealed no cultvar ID in 2016.
2/4/2016	Back Field (BF)	50	BF-Ap-013	Apple	Malus	domestica	unknown	15	Historic			Fair	Likely historic, age unknown. Pruned in 2003, 2012. Sent to USDA in 2011: no match in USDA database.
2/4/2016	Back Field (BF)	51	BF-Ap-014	Apple	Malus	domestica	No cultivar match in 2016	18	Historic			Good	Likely historic, age unknown. Pruned in 2003, 2010, 2011, 2012. Ram Fishman id'd. Testing revealed no cultvar ID in 2016.

Table 3.3

2/4/2016	Back Field (BF)	53	BF-Ap-015	Apple	Malus	domestica	unknown	15.6	Historic			Fair	LIkely historic, age unknown. Pruned in 2003, 2010, 2011, 2012. Ram Fishman and Susan Dolan id'd as 'Rhode Island Greening'...Charlie Bull says 'Ashmeads Kernal'. Sent to USDA in 2011: no match for either in USDA database.
2/4/2016	Back Field (BF)	32	BF-Ap-016	Apple	Malus	domestica	unknown	21.2	Historic			Poor	Presumed historic, possibly from late 1800's per R. Montenegro. Pruned in 2012. Ram Fishman id'd: no record of id.
2/4/2016	Back Field (BF)	33	BF-Ap-017	Apple	Malus	domestica	No cultivar match in 2016	16.2	Historic			Poor	Presumed historic, possibly from 1870's per R. Montenegro. Pruned in 2003, 2012. Ram Fishman...
2/4/2016	Back Field (BF)	34	BF-Ap-018	Apple	Malus	domestica	Grimes Golden'?	21	Historic			Dead	Presumed historic, possibly from 1890's per R. Montenegro. Pruned in 2003, 2012. Ram Fishman thought was 'Grimes Golden'. Sent to USDA for genetic id: no match, and 'Grimes Golden' not in USDA database. Dead as of 2016.
2/4/2016	Back Field (BF)	35B	BF-Ap-019	Apple	Malus	domestica	No cultivar match in 2016				Unknown	Fair	Probably not historic. Pruned in 2003, 2012. Grafted scions planted in Camden House yard.
2/4/2016	Back Field (BF)	40	BF-Ap-020	Apple	Malus	domestica	unknown	13.6			Unknown	Fair	Probably not historic, from 1940's per R. Montenegro. Pruned in 2012. Sent to USDA in 2011: no match in USDA database. Two grafted scions planted in Camden House yard.
2/4/2016	Back Field (BF)	40A	BF-Ap-021	Apple	Malus	domestica	unknown	14.2			Unknown	Fair	Probably not historic, age unknown. Pruned in 2012.
2/4/2016	Back Field (BF)	40B	BF-Ap-022	Apple	Malus	domestica	unknown	7			Unknown	Poor	Probably not historic, age unknown. Pruned in 2012.
2/4/2016	Back Field (BF)	40C	BF-Ap-023	Apple	Malus	domestica	unknown	8.8		Non-Historic		Poor	Probably not historic, age unknown. Pruned in 2012.
2/4/2016	Back Field (BF)	40D	BF-Ap-024	Apple	Malus	domestica	unknown	7.2		Non-Historic		Poor	Probably not historic, age unknown. Pruned in 2012.
2/4/2016	Back Field (BF)	BC	BF-Ch-001	Cherry	Prunus		unknown		Historic			Fair	Possibly historic, age unknown. Pruned in 2010, 2012.
2/4/2016	Back Field (BF)	43	BF-Ch-002	Sweet Cherry	Prunus	avium	unknown	2.4		Non-Historic		Fair	Non historic seedling, Pruned in 2012.
2/4/2016	Back Field (BF)	44	BF-Ch-003	Sweet Cherry	Prunus	avium	unknown	7.8			Unknown	Poor	Age unknown, likely not historic. Pruned in 2012.
2/4/2016	Back Field (BF)	48A	BF-Ch-004	Cherry	Prunus		unknown	11.6			Unknown	Poor	Age unknown, likely not historic. Pruned in 2012. Gummosis
2/4/2016	Back Field (BF)	None	BF-Ch-005	Cherry	Prunus		unknown					Dead	Dead, no field ID tag: Recorded to establish tree locations only.
2/4/2016	Back Field (BF)	Dead	BF-Ch-006	Cherry	Prunus		unknown	7.8				Dead	Dead, recorded to establish tree pattern on slope.
2/4/2016	Back Field (BF)	40E	BF-Pr-001	Pear	Pyrus	communis	unknown	6.4		Non-Historic		Poor	Likely non-historic seedling.
2/4/2016	Back Field (BF)	BP2	BF-Pr-002	Pear	Pyrus	communis	unknown	11.2			Unknown	Poor	Pruned 2010, 2012.
2/4/2016	Back Field (BF)	35A	BF-Pr-003	Pear	Pyrus	communis	unknown	8.2			Unknown	Fair	Pruned 2012.
2/4/2016	Back Field (BF)	PBP	BF-Pr-004	Pear	Pyrus	communis	unknown	13	Historic			Fair	Possibly historic, age unknown. Pruned 2012.
2/4/2016	Back Field (BF)	NP2	BF-Pr-005	Pear	Pyrus	communis	unknown	7		Non-Historic		Good	Pruned 2012. Very columnar single leader.
2/4/2016	Back Field (BF)	PT	BF-Ps-001	Persimmon	Diospyros	virginiana					Unknown	Good	Unknown age of cluster, species is invasive. Pruned 2012. A large thicket of small diameter trees, 2-6" dbh.
2/4/2016	Back Field (BF)		BF-Ap-025	Apple	Malus		unknown	5.4		Non-Historic		Fair	Double leader, not labeled.

Interim Orchard Management Plan

Tower House Historic District - Back Field (BF) | Existing Conditions Map

Pacific West Regional Office | Cultural Landscapes Program | 2016

Willow Creek

Lower Crystal Creek Ditch and Camden Water Ditch Trail

Levi Tower Grave Trail

Highway 299

French Gulch Field (FG)

Camden House Yard (CY)

Nursery

Camden House

Legend

Map 3.4

- Back Field Boundary
- Adjacent Orchard Boundary
- Trail
- Creek
- Apple (AP)
- Cherry (CH)
- Pear (PR)
- Persimmon Grove (PS)

Map Key #	Tree ID #	Status	Map Key #	Tree ID #	Status
00	BF-AP-001	H	18	BF-CH-003	U
01	BF-AP-002	H	19	BF-AP-009	H
02	BF-AP-025	NH	20	BF-AP-010	H
03	BF-AP-004	H	21	BF-AP-011	H
04	BF-AP-003	H	22	BF-CH-004	U
05	BF-AP-006	H	23	BF-CH-005	D
06	BF-AP-007	H	24	BF-PR-003	U
07	BF-AP-008	H	25	BF-PR-004	H
08	BF-CH-001	H	26	BF-AP-018	H
09	BF-PR-002	U	27	BF-AP-017	H
10	BF-PR-001	NH	28	BF-PS-001	U
11	BF-AP-024	NH	29	BF-AP-016	H
12	BF-AP-023	NH	30	BF-PR-005	NH
13	BF-AP-022	U	31	BF-AP-015	H
14	BF-AP-021	U	32	BF-AP-014	H
15	BF-AP-020	U	33	BF-AP-013	H
16	BF-AP-019	U	34	BF-AP-012	U
17	BF-CH-002	NH	35	BF-CH-006	D

Status: H = historic, NH = non-historic, U = unknown, D = dead

0 100 200 feet

Tenant House (TH)

Current Size: 9 acres

Location: The Tenant House area is located in the Tower House Historic District within Whiskeytown National Recreation Area. The orchard is situated west of Willow Creek and includes several elements such as a flat linear field associated with the barn, a vegetated lawn area associated with the Tenant House and an area known as the "Mill Garden" on the west side of Mill Creek.

Total Number of Extant Fruit Trees: 42 trees assessed

Status: Number of fruit or nut trees and their status: historic, non-historic and unknown for the Tenant House Orchard:

- Historic: 12% (5/42)
- Non-Historic: 10% (4/42)
- Unknown: 78% (33/42)

Condition: Number of fruit or nut trees in good, fair and poor condition or dead for the Tenant House:

- Good: 7% (3/42)
- Fair: 26% (11/42)
- Poor: 65% (27/42)
- Dead: 2% (1/42)

Species Represented:

- Apple: 57% (24/42)
- Crabapple: 3% (1/42)
- Cherry: 31% (13/42)
- Cherry Plum: 2% (1/42)
- Grape: 2% (1/42)
- Pear: 5% (2/42)

Major tree stressors in the Tenant House:

- Overshading and encroaching vegetation above canopy
- Encroaching vegetation within root zone
- Accumulated debris within root zone
- Moss or lichen on tree
- Trunk flare buried
- Bear damage

Figure 3.24: Photograph of the Tenant House looking southeast toward the hay barn, 2016 (PWR Cultural Landscapes Program).

Figure 3.25: Photograph of the Tenant House looking southeast showing a grape and snowball bush along the fence, 2016 (PWR Cultural Landscapes Program).

Table 3.4

General Information				Tree Botanical and Historical Information								Tree Condition	General Notes and Tree Work History
Date	Location	Old ID	New ID	Tree Type	Genus	Species	Cultivar/Variety	DBH	Historic	Non-Historic	Unknown		
2/4/2016	Tenant House (TH)	54	TH-Ap-001	Apple	Malus	domestica	Reinette Franche	16	Historic			Poor	Pruned 2003, 2010, 2011. C.Bull ID'd as 'Cookes Seedling' but USDA results ID'd as 'Reinette Fanche'. Approximately 100 years old.
2/4/2016	Tenant House (TH)	55	TH-Ap-002	Apple	Malus	domestica	unknown	9	Historic			Poor	Pruned 2010, 2011, 2015. Approximately 80-100 years old. USDA sample returned no match in 2011.
2/4/2016	Tenant House (TH)	57	TH-Ap-003	Apple	Malus	domestica	unknown	15.6	Historic			Poor	Pruned 2003, 2010, 2011, 2015. Described as "apple seedling", approximately 80-100 years old.
2/4/2016	Tenant House (TH)	58	TH-Ap-004	Apple	Malus	domestica	unknown				Unknown	Dead	Pruned 2010, 2011. Died in 2014, engulfed in poison oak. Described as "apple seedling".
2/4/2016	Tenant House (TH)	59	TH-Ap-005	Apple	Malus	domestica	unknown	12			Unknown	Fair	Pruned 2010, 2011, 2015. Described as "apple seedling", 60-80 years old.
2/4/2016	Tenant House (TH)		TH-Ap-006	Apple	Malus	domestica	unknown	4			Unknown	Poor	Next 61 and 60A. Could be the 'Grimes Golden'. new growth from dead trunk
2/4/2016	Tenant House (TH)	60A	TH-Ap-007	Apple	Malus	domestica	unknown	6.4		Non-Historic		Poor	Is this the 'Grimes Golden'? About 25 years old. Was labeled "TH-Unk-001". Pruned 2015.
2/4/2016	Tenant House (TH)	62B	TH-Ap-008	Apple	Malus	domestica	unknown	7.4		Non-Historic		Fair	Pruned 2011, 2015. C. Bull ID'd as 'Sierra Beauty' or 'Grimes Golden'. USDA yielded no matches in 2011. Originally labelled 'Sierra Beauty' but matches 'Grimes Golden'.
2/4/2016	Tenant House (TH)	62A	TH-Ap-009	Apple	Malus	domestica	No cultivar match in 2016			Non-Historic		Fair	Pruned 2011, 2015. Notes claim tree is 15-20 years old. Testing in 2016 revealed no match with known cultivars.
2/4/2016	Tenant House (TH)	64	TH-Ap-010	Apple	Malus	domestica	unknown	6.2		Non-Historic		Fair	Pruned 2010, 2011, 2015. ID'd by someone as 'Rhode Island Greening' USDA test returned no matches for this or other cultivars. 20 years old. Sucker or seedling?
2/4/2016	Tenant House (TH)	67	TH-Ap-011	Apple	Malus	domestica	No cultivar match in 2016	26	Historic			Poor	Pruned 2010, 2011, 2015. Approximately 125 years old or from 1890's. Ram Fishman ID'd. Testing in 2016 revealed no match with known cultivars.
2/4/2016	Tenant House (TH)	69	TH-Ap-012	Apple	Malus	domestica	No cultivar match in 2016	8.4			Unknown	Fair	Pruned 2010, 2011, 2015. Approximately 50 years old. Double leader, 8.5 dbh Testing in 2016 revealed no match with known cultivars.
2/4/2016	Tenant House (TH)	68	TH-Ap-013	Apple	Malus	domestica	No cultivar match in 2016	15			Unknown	Fair	Pruned 2010, 2011, 2015. Approximately 25-40 years old, ID'd by Ram Fishman. Testing in 2016 revealed no match with known cultivars.
2/4/2016	Tenant House (TH)	A unk 4	TH-Ap-014	Apple	Malus	domestica	unknown	7.8			Unknown	Poor	Pruned 2015. Possibly sucker from older tree.
2/4/2016	Tenant House (TH)	A unk 5	TH-Ap-015	Apple	Malus	domestica	unknown	6.4			Unknown	Poor	
2/4/2016	Tenant House (TH)	A unk 2	TH-Ap-016	Apple	Malus	domestica	unknown	3			Unknown	Poor	3 stems arising from sideways main trunk
2/4/2016	Tenant House (TH)	A unk 1	TH-Ap-017	Apple	Malus	domestica	unknown	5.6			Unknown	Poor	Pruned 2015.
2/4/2016	Tenant House (TH)	A unk 3	TH-Ap-018	Apple	Malus	domestica	unknown	9			Unknown	Poor	Pruned 2015.Approximately 50-60 year old seedling or sucker.
2/4/2016	Tenant House (TH)	63AB	TH-Ap-019	Apple	Malus	domestica	unknown	6.8			Unknown	Poor	Pruned 2011, 2015. Labeled as a cherry tree, but actually an apple (fka TH-Ch-002). 25-30 years old, possibly a sucker from original tree.
2/4/2016	Tenant House (TH)		TH-Ap-020	Apple	Malus	domestica	unknown	9			Unknown	Poor	Pruned 2015. Old tree in the mill garden, no signs of pruning or care. 35-40 years old, possibly a sucker from another tree.
2/4/2016	Tenant House (TH)		TH-Ap-021	Apple	Malus	domestica	unknown	7			Unknown	Poor	Pruned 2015. Old tree in the mill garden, no signs of pruning or care. 35-40 years old, possibly a sucker from another tree.
2/4/2016	Tenant House (TH)		TH-Ap-022	Apple	Malus	domestica	unknown	12			Unknown	Poor	Pruned 2015. Old tree in the mill garden, no signs of pruning or care. 70 - 80 years old.
2/4/2016	Tenant House (TH)		TH-Ap-023	Apple	Malus	domestica	unknown	16.4			Unknown	Poor	Pruned 2015. Old tree in the mill garden, no signs of pruning or care.
2/4/2016	Tenant House (TH)	70	TH-Ap-024	Apple	Malus	domestica	unknown	16.4	Historic			Poor	Pruned 2015. Approximately 80-90 years old. Some labeling confusion between tree previously ID'd as "70" and apple tree CY-Ap-048, which was possibly renamed TH-Ap-19? This record renamed as Ap-024.
2/4/2016	Tenant House (TH)	66	TH-Ca-001	Crabapple	Malus	domestica	unknown	12			Unknown	Fair	Pruned 2010, 2011, 2015. Approximately 50-60 years old.
2/4/2016	Tenant House (TH)	52	TH-Ch-001	Cherry	Prunus		unknown	12			Unknown	Poor	Pruned 2003, 2015. Approximately 50-60 years old.
2/4/2016	Tenant House (TH)	61	TH-Ch-003	Cherry	Prunus		unknown	13.8			Unknown	Poor	Pruned 2003, 2015. Approximately 60 years old, Ram Fishman ID'd.
2/4/2016	Tenant House (TH)		TH-Ch-004	Cherry	Prunus		unknown				Unknown	Good	Pruned 2015. 35-40 years old.
2/4/2016	Tenant House (TH)		TH-Ch-005	Cherry	Prunus		unknown	4			Unknown	Poor	Water sprout from old trunk, amid cluster of suckers.
2/4/2016	Tenant House (TH)		TH-Ch-008	Cherry	Prunus		unknown	8.6			Unknown	Fair	
2/4/2016	Tenant House (TH)		TH-Ch-009	Cherry	Prunus		unknown	13			Unknown	Fair	Not on original list.
2/4/2016	Tenant House (TH)		TH-Ch-010	Cherry			unknown	8			Unknown	Poor	Not on original list.
2/4/2016	Tenant House (TH)		TH-Ch-011	Cherry	Prunus		unknown	10.8			Unknown	Poor	Not on original list.

Table 3.4

2/4/2016	Tenant House (TH)		TH-Ch-012	Cherry			unknown	12.2			Unknown	Poor	Not on original list.
2/4/2016	Tenant House (TH)		TH-Ch-013	Cherry			unknown	10.2			Unknown	Poor	Not on original list.
2/4/2016	Tenant House (TH)		TH-Ch-014	Cherry			unknown	9			Unknown	Poor	Tall tree in mill garden.
2/4/2016	Tenant House (TH)		TH-Ch-015	Cherry			unknown	8			Unknown	Fair	Tall trunk in mill garden.
2/4/2016	Tenant House (TH)		TH-Ch-016	Cherry	Prunus			9			Unknown	Poor	A cluster of 6 tall cherry trees n mill garden.
2/4/2016	Tenant House (TH)		TH-Cp-001	Cherry Plum	Prunus	cerasifera	unknown	10			Unknown	Fair	Approximately 50-60 years old. Double leaders 9 & 10 dbh.
2/4/2016	Tenant House (TH)		TH-Gr-001	Grape	Vitis		unknown				Unknown	Good	Possibly historic vine. Test for genetics, possibly mission grape?
2/4/2016	Tenant House (TH)		TH-Pr-001	Pear	Pyrus	communis	unknown	12.4			Unknown	Good	Pruned 2010, 2011, 2015. Described as "pear seedling", 50-60 years old.
2/4/2016	Tenant House (TH)		TH-Pr-002	Pear	Pyrus	communis	unknown	7			Unknown	Poor	Double leader 7" dbh both.

Interim Orchard Management Plan

Tower House Historic District - Tenant House(TH) | Existing Conditions Map

Pacific West Regional Office | Cultural Landscapes Program | 2016

Back Field (BF)

Levi Tower Grave Trail

Camden House Yard (CY)

Willow Creek

Mill Garden

Lower Crystal Creek Ditch and Camden Water Ditch Trail

Mill Creek

Legend

Map 3.5

- Historic District Boundary
- Tenant House Boundary
- Adjacent Orchard Boundary
- Trail
- Creek
- Apple (AP)
- Crabapple (CA)
- Cherry (CH)
- Pear (PR)
- Cherry Plum (CP)

Status: H = historic, NH = non-historic, U = unknown, D = dead

0 100 200 feet

Map ID #	Tree ID #	Status
00	TH-CH-001	U
01	TH-CH-009	U
02	TH-CH-010	U
03	TH-CH-011	U
04	TH-CH-012	U
05	TH-CH-013	U
06	TH-AP-002	H
07	TH-AP-001	H
08	TH-AP-003	H
09	TH-AP-004	U
10	TH-AP-005	U
11	TH-PR-002	U
12	TH-AP-007	NH
13	TH-CH-003	U
14	TH-CH-005	U
15	TH-AP-008	NH
16	TH-AP-006	U
17	TH-AP-019	U
18	TH-CH-004	U
19	TH-AP-009	NH
20	TH-AP-010	NH
21	TH-PR-001	U
22	TH-CA-001	U
23	TH-GR-001	U
24	TH-AP-011	H
25	TH-AP-013	U
26	TH-AP-012	U
27	TH-AP-024	H
28	TH-CP-001	U
29	TH-AP-014	U
30	TH-AP-015	U
31	TH-AP-016	U
32	TH-AP-017	U
33	TH-CH-015	U
34	TH-CH-014	U
35	TH-CH-016	U
36	TH-AP-022	U
37	TH-AP-021	U
38	TH-AP-020	U
39	TH-AP-023	U
40	TH-CH-008	U
41	TH-AP-018	U

Summary of the Crystal Creek Ditch

National Register of Historic Places

The Crystal Creek Ditch is located in Whiskeytown NRA and is part of a complex system of ditches that were historically used to support agricultural and mining activities in the locale. Components of the ditch may date to the early to mid-1850s; however, portions of the system have been added or modified through time to meet changing needs. Despite several historical research and documentation efforts, detailed information regarding changes to the irrigation system through time is not available.

The National Register of Historic Places nomination form for the Tower House Historic District identified the irrigation system as a contributing component of the district. The 1973 nomination noted that "A redwood water storage tank has pipes leading from it that conduct water to the Camden House grounds and to the pasture across the creek behind the Camden House. This irrigation system still works and is being actively used on the recently planted pasture." Supplemental National Register documentation of the ditch system noted that it had "evolved over a long period of time, with each succeeding user making necessary repairs or modifications with the best materials and methods at hand."

Crystal Creek Ditch Summary

The following physical description of the Crystal Creek Ditch is adapted from two documents prepared by Shelly Davis-King in 1997 and 2003. See bibliography for additional information. The first paragraph offers a description typical ditch engineering characteristic of the period, while the following paragraph offers a physical description of the system. Today, the ditch system in its entirety is referred to as the Crystal Creek Ditch; however, documents such as the Cultural Landscape Report, Part I have divided the ditch into two components: Lower Crystal Creek Ditch (also known as the Willow Creek Ditch) and Upper Crystal Creek Ditch. The Lower Crystal Creek Ditch diverts water from Crystal Creek, just above its confluence with Willow Creek, while the point of diversion for the Upper Crystal Creek Ditch is situated one mile west of the Camden House, eventually extending traversing the east side of Highway 299.

Typical Ditch Engineering

Ditches such as the Crystal Creek were constructed throughout California between the mid-1800s until the mid-1900s. Typically, the slopes of these ditches ranged between 10 and 12 vertical feet per mile. Ditches with slopes of 16 to 20 feet per mile were not uncommon. These ditches were lined at different time with various materials including earth, rubble, wood, concrete, gunite, and dry-laid stones. Side slopes typically were 1 ½ : 1 for cuts and 2 : 1 for fills. The engineers of these systems designed structures for velocity control, silt removal, siphoning, and debris removal. Early designers also designed ditches to minimize losses from evaporation, seepage, and aquatic vegetation. Many of the typical design features found in the California ditches were implemented in the Crystal Creek system.

Physical Description

The Crystal Creek Ditch system is an earthen ditch that historically provided irrigation water to the Camden House and the French Gulch Field. Water enters the system at the headworks located approximately 0.80 miles upstream from the existing pump house and clean-out shed (located off Mill Creek Road approximately one-quarter of a mile from Highway 299). Once in the ditch, water encounters various structures, including a silt trap, tunnel, metal flume, and several drainage crossovers, until it reaches a clean-out shed and an inverted siphon. The siphon transports water across the Willow Creek drainage and beneath Highway 299. Water then travels parallel to the highway through several earthen and concrete channel sections to the redwood storage tank located near the intersection of Trinity Mountain Road and Highway 299. At the tank, water can be diverted directly to the Camden House grounds through an existing system of underground piping, which extends under Highway 299, or it can continue another approximately 300 feet to down drains which pipe water under Trinity Mountain Road and into the French Gulch Field. The system measures approximately one and one-half miles in total length and has a total elevation drop of approximately forty-one feet.[53]

For more detailed information regarding specific segments and associated features of the Crystal Creek Ditch see:

Shelly Davis-King, *Bringing Water to the Mines: A Description of the Ditch System Built by Charles Camden in the Tower House Historic District, Whiskeytown National Recreation Area, Shasta County*, California, Architectural Resources Group, San Francisco, CA, 2003. Linear Feature Record, Primary #: P-45-002692, Trinomial: CA-SHA-2692H, Resource Name: Crystal Creek Ditch, 1.

Existing Conditions

In 2013, a high water event damaged the Crystal Creek Ditch. Impacts to the system included "…shifting the stream course away from the diversion structure, damaging the head works, breaching a section of the ditch approximately 12 meters in length, depositing large amounts of silt throughout the impacted section of ditch, and destabilizing the ditch structure…" [54] As a result of this event, portions of the Crystal Creek Ditch are no longer in operable condition; however, the park seeks to repair damages to the system as soon as possible.

Treatments were recommended in the 2015 "Crystal Creek Water Ditch Assessment and Treatment Repair Report" to repair the ditch system so that it can convey irrigation water to the orchards and fruit trees associated with the THHD. See selected recommendations below from this report.

[53] Shelly Davis-King, "Engineering Report" in *Bringing Water to the Garden: A Description of Two Ditches in the Tower House Historic District, Whiskeytown National Recreation Area, Shasta County, California,* 1997, 2.
[54] Whiskeytown National Recreation Area, Crystal Creek Water Ditch Assessment and Treatment Repair Report, Task Order No. P14PD01915. Prepared by MIG, Portland Oregon, and February 2015, 1-2.

- Irrigation requirements for the orchard watered by the ditch should be determined and the flow rate in the ditch adjusted accordingly. In light of changes in precipitation amounts and occurrences due to known and anticipated climate change impacts, this should be reviewed annually.

- Future repairs should avoid non-historic materials and non-historic techniques.[55]

THHD Interim Orchard Management Plan Recommendations

As noted above, repair of the ditch is critical to implementing irrigation and enhanced interpretation alternatives outlined in the THHD Interim Orchard Management Plan. As part of this plan, basic objectives for rehabilitation of the Upper Crystal Creek Ditch include utilization of the existing Upper Crystal Creek Ditch system to support representative orchards in the French Gulch Field. The proposed system would function using the following strategies:

- Water would be drawn from the redwood water tank and associated Upper Crystal Creek Ditch to supply one or two open channels (semicircular metal flumes), which currently require rehabilitation, down slope to culverts situated under two extant stone masonry spillways.

- The water would pass under one or two culverts under Trinity Mountain Road into the French Gulch Field.
    - After entering the field, the water could be distributed to the proposed fruit trees through a rehabilitated ditch located near the Yreka Road trace or through flood irrigation techniques that are compatible with the character of the historic district.

See existing conditions photos below for additional information regarding extant features associated with the proposed French Gulch Field irrigation system.

[55] Whiskeytown National Recreation Area, Crystal Creek Water Ditch Assessment and Treatment Repair Report, Task Order No. P14PD01915. Prepared by MIG, Portland Oregon, February 2015, 10-11.

Figure 3.26: Photograph showing the redwood water tank located adjacent to the Upper Crystal Creek Ditch. When the ditch is operational, water from the tank is fed under Highway 299 to the Camden House, 2016 (PWR Cultural Landscapes Program).

Figure 3.27: Photograph showing a portion of the Upper Crystal Creek Ditch, which is currently dry, 2016 (PWR Cultural Landscapes Program).

Figure 3.28: Photograph showing a portion of a remnant metal flume located on the slope below the Upper Crystal Creek Ditch, 2016 (PWR Cultural Landscapes Program).

Figure 3.29: Photograph showing a remnant stone masonry spillway and metal pipe culvert located on the slope adjacent to the Trinity Mountain Road, 2016. The feature is associated with the Upper Crystal Creek Ditch system (PWR Cultural Landscapes Program).

Figure 3.30: Photograph showing a remnant stone masonry spillway on the slope in the background, the Trinity Mountain Road bench and the associated culvert under the road, which historically fed water from the Upper Crystal Creek Ditch to the French Gulch Field, 2016 (PWR Cultural Landscapes Program).

Section Four: Orchard Stabilization and Historic Fruit Tree Management

ORCHARD STABILIZATION RECOMMENDATIONS

Introduction

This chapter addresses stabilization of the orchard areas and individual fruit trees at the THHD within Whiskeytown NRA. The recommendations in this chapter serve as a guide to immediate future actions necessary to arrest the rate of decline of the fruit trees, particularly those that are historically significant, until long-term orchard management practices can be performed.

Tree Assessments and Monitoring

Performing a one-time, comprehensive baseline assessment of all extant orchard fruit trees is the first step towards prioritizing stabilization work and making subsequent management decisions. The Fruit Tree Condition Assessment Field Form developed by the National Park Service is ideal for this purpose. During a site visit in February 2016, all the existing fruit trees within the THHD were assessed using the Fruit Tree Condition Assessment Field Form. Results from the assessment are summarized in various tables throughout this report.

Scope of Stabilization

Stabilization is not meant to be practiced in perpetuity. Stabilization is a one-time, up-front intervention intended to assess and correct critical plant health issues in the near term, in order to extend the health and life of the plant for as long as possible.

For the orchards associated with the THHD, the goal of stabilization is identifying those fruit trees deemed to be of significant historical value and enacting specific, positive, interventions to keep them alive for as long as possible. Stabilization can encompass interventions of a physical, horticultural or mechanical nature, but is not intended as a final step in orchard preservation: rather, it is the prelude to future preservation maintenance actions.

The goal of orchard tree stabilization is a reduction, mitigation or elimination of as many tree health stressors as possible by utilizing specific and targeted actions. Many of these actions will include standard best orchard management practices, some actions may even be administrative in nature, and different actions may be required for different trees or orchard spaces.

Fruit Tree Stressors in THHD Orchards

Quantifying and understanding the range of plant health stressors in the orchards at THHD will lead to more informed management decisions and assist in prioritizing stabilization tasks. The following section enumerates the types of tree health stressors observed or likely to occur in the THHD orchards, and is based on the results of comprehensive fruit tree assessments completed in February 2016.

Stressors may be present in a variety of forms: biotic, abiotic or structural. Biotic stressors include living organic organisms that directly or indirectly affect tree health through feeding, infestation or interference with normal healthy tree growth. Agents capable of biotic stress in fruit trees can range from microorganisms such as fungi, bacteria and insects to larger fauna such as birds, deer and bears. Humans are potential biotic stressors for fruit trees as well, but will be addressed in the subsequent section on cultural stressors.

Abiotic stressors are non-living environmental factors that can lead to decline or death of a fruit tree. Examples of potential abiotic stressors in the THHD orchards include drought, flood or fire.

Structural stressors are mechanical in nature, such as fragile tree parts likely to fall off and do further damage, or destabilized or leaning tree trunks that may fall over and cause the tree to perish.

The major fruit tree stressors in the THHD orchards are:

- Encroaching vegetation and/or overshading
- Structurally unsound trunks and/or limbs
- Buried trunk flare at ground level
- Suckers and/or watersprouts
- Wildlife damage

Recommendation:
Monitor fruit tree health on a regular basis to observe and quantify any new incidence of tree health stressors and track the rate of change of existing stressors.

Biotic Stressors: Fungi and Bacteria

Summary of fungal and bacterial stressors in the THHD orchards:

- Fireblight (Erwinia amylovora)
- Diplodia (Diplodia seriata)
- Peach leaf curl (Taphrina deformans)

Fireblight

Fireblight (Erwinia amylovora) is a bacterial agent that affects pome fruits and other plants in the rosaceae family. The disease signs include blackened, wilted blossoms and young new growth in spring and summer. Latent infections appear on the branches and trunks of trees as cankers from which new infections may be spread. Where fruit orchards are concerned, fireblight can be a serious issue for apples, pears and quince. The fireblight bacterium overwinters on twigs and existing cankers on fruit tree trunks and branches and when conditions are right infect the tree through wounds or open flower buds. When the weather in spring is sufficiently warm and moist the bacteria multiply and spread to vulnerable plant tissue through splashing water, or once a flower has been infected the disease can be vectored to other flowers and trees by bees and other pollinators. Pruning cuts can also be a point of entry for new infection and it is imperative to prune fireblight-stricken fruit trees correctly and with the proper sanitary controls in place and to dispose of the blighted trimmings off site to reduce inoculum.


Figure 4.1: Fireblight on a pear shoot.

Recommendation:
Prune fireblight infected material from pear, apple and quince trees as soon as possible using sharp and sterile tools. Make removal cuts at least 6” or more below the point of infection on small branches, sterilize tools with rubbing alcohol or flame in between cuts to prevent disease transmission. Collect and burn all blighted trimmings, or dispose of it off site to remove the potential for disease transmission from the orchard.

Diplodia

Diplodia seriata is a fungal canker disease in the botryosphaeriaceae family that affects apples, among many other susceptible plants. D. seriata was identified on several apple trees in the French Gulch Field in 2014, specifically tree FG-Ap-007 and probably FG-Ap-008 and FG-Ap-009 as well. Although the disease D. seriata is known to afflict apples in other regions of the country (Washington State, for example), its appearance in this region of California is a relatively new phenomenon.

Recommendation:
As with any diseased fruit tree material, the affected parts should be pruned off below the point of infection with sterile pruning tools and discarded off site. (See Supplemental Information for email correspondence discussing the presence of Diplodia seriata in the French Gulch Field).

Peach Leaf Curl

Peach trees have been recommended for reintroduction into the French Gulch Field in the treatment alternatives, so it is important to understand the fungal disease known as peach leaf curl as a potential and even likely issue in the orchards within the THHD.

Peach leaf curl (Taphrina deformans) is a fungal pathogen that overwinters on bark and twigs of peach trees and initially affects tender new foliage as it emerges in spring. Leaves become puckered and reddish and may fall off. Repeated annual cycles of infection can result in depleted tree energy reserves and weakened less healthy trees. Fruit may be affected but not to a severe degree. The primary concern with T. deformans is the potential loss of healthy, vigorous peach trees. Some peach cultivars are resistant to peach leaf curl and may be acceptable for use in historic orchards as those at THHD.


Figure 4.2: Peach leaf curl.

Recommendation:
Spraying dormant peach trees at least twice a year with a copper-based fungicide is the best means to control the spread of this pernicious disease. Spray once in early winter and again in spring, just prior to bud break (leaf emergence) for best results, but avoid spraying once flowers have formed. Choose a copper-based product that has a high fixed-copper MCE (metallic-copper equivalent) such as Kop-r-spray® or Liquicop®.

Blackline Disease

Blackline disease is specific to walnut trees, which were once prominent historic features of the landscape around the Camden and Tower houses. There is no evidence that the blackline disease (also called "cherry leafroll virus") is present at the THHD, or that it had any effect on the historic walnut trees, however it may be an important consideration in the future if walnut trees are reintroduced into the orchards. The virus affects only grafted walnut trees that are joined to black walnut or Paradox walnut rootstock, which was very common historically. Walnut trees that are grafted to English rootstock or are ungrafted do not exhibit symptoms from the disease, even if it is present in the tree. Typically an infected tree will perish at the graft union, forming dead tissue cells that eventually kill the upper part of the grafted tree, leaving the black walnut or Paradox rootstock to re-sprout.

Recommendation:
Historically, English walnut trees were grafted onto black walnut rootstock, and this would be the authentic preservation practice in the orchards at the THHD. However, to avoid a situation where blackline disease affects the walnut trees, consider planting English walnuts grafted onto English rootstock, or plant ungrafted English walnut trees.

Pathogenic Disease Management: Remove or Burn

An important aspect of orchard stabilization is reducing or eliminating as much pest and disease pressure as possible. Prolonged exposure to stressors such as pest and disease can hasten the demise of fruit trees if left unchecked.

Recommendation:
Removing as much of the source of disease inoculum is a practical orchard sanitation measure and should be practiced without exception. Gather all diseased tree material (twigs, branches, leaves and fruit) and remove it from the site or burn it on site if permissible. Do not try to compost diseased fruit tree material as temperatures generated by the decomposing green waste may not be high enough to kill all the diseases or pests present.

Biotic Stressors*:* Insect Pests

Summary of insect pests in the THHD orchards:

- Codling moth
- Aphids
- Scale

Codling Moth

The February 2016 THHD orchard assessment did not observe codling moth only because of the time of the year that the orchard was visited; however, this fruit pest is so ubiquitous among orchards in California that its presence can be inferred.

Codling moth is a pest that affects the fruit and nuts of apple, pear and English walnut trees in California. The larva of the codling moth bore into ripening fruit and nuts and tunnel to the center, leaving the fruit with soft, brown frass inside that renders it unmarketable and undesirable to eat. If codling moth damage in the THHD orchards is an issue that needs to be addressed there are a range of integrated pest management techniques to combat the problem.

Figure 4.3: Codling moth damage on developing apples.

Recommendation:
Cultural controls include hand-thinning the fruit early in the season so they do not touch each other (codling moths favor tightly clustered fruit). Chemical controls are available if codling moth populations become severe, however, the use of pesticides must be weighed against the benefit, particularly if fruit production is not a primary orchard goal. Codling moth control is critical for the commercial fruit industry, but may not be as important in historic orchard stabilization where the primary concern is the health of the tree itself. In historic orchards fruit production is often considered to be an ancillary benefit of cultivation, unlike in commercial orchards.

Aphids

Aphids are among the most widespread and common pest of fruit trees and many other vegetative crops and thousands of species exist. While relatively innocuous, in great numbers aphids can tax the health of a tree by feeding on leaves and decreasing the ability to photosynthesize. One exception to this is the rosy apple aphid which can cause leaf curling and can adversely affect the quality of fruit. Aphids use piercing/sucking mouthparts to penetrate leaf tissue and suck sap from the cells of the leaf. Aphid infestation is often associated with the presence of ants, which manage the aphids as a resource for the honeydew that they excrete as a byproduct of feeding on fruit trees. Fruit trees most likely to be affected at the THHD include apple, cherry, peach and pear.

Recommendation:
Unless severe infestations occur or rosy apple aphids are observed, there is probably little need to spend time and energy combatting aphids in the THHD orchards. Spraying foliage with a stiff stream of water will dislodge many of the aphids and leave them unable to crawl

back into the canopy. Horticultural oils and soaps are also available if pest pressure requires management action. Natural insect predators of aphids are often sufficient to prevent severe infestations; such insects include lady beetles, lacewings, syrphid flies and soldier beetles. To control ants in affected fruit trees, use a product such as Tanglefoot around the trunks of the trees to deny ants access to the upper limbs where aphids reside.


Figures 4.4 and 4.5: Aphids (left) and Scales (right).

Scales

Scales are similar to aphids in that they feed on plant foliage and twigs using piercing/sucking mouthparts and excrete a sticky honeydew substance that can grow a dark sooty mold that in turn affects photosynthesis. Scale species are numerous and are classified into two general categories: soft scale and armored scale. Soft scale produces a waxy substance that covers and protects the insect, and armored scale grows a hard protective shell over its body. Severe scale infestations can weaken and stunt tree growth and should be addressed if populations are high.

Recommendation:
Horticultural oils can reduce scale problems by coating the insects and suffocating them. Natural enemies such as predatory wasps also help control scale, but ants tend to defend the scale and will fight or discourage natural enemies from approaching the scale. To control ants apply a sticky substance such as Tanglefoot around the trunks of trees to deny them access to the scale in the canopy of the tree.

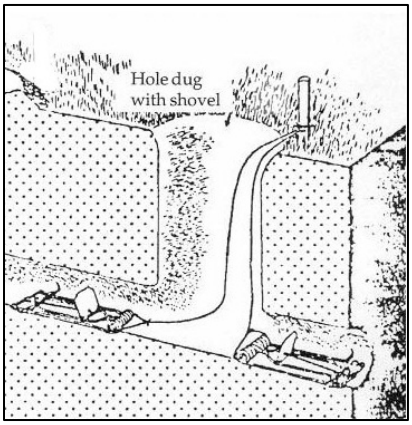
Biotic Stressors: **Vertebrate Pests**

Summary of vertebrate pests in the THHD orchards:

- Gophers
- Voles
- Sapsuckers (i.e. birds)
- Deer
- Bear

Gophers

Gophers (Thomomys sp.) are a serious threat to orchard trees, especially young and newly planted trees. Gophers have the potential to severely weaken and destabilize fruit trees by chewing underground roots and even the bark around the base of a tree and should be a priority for orchard stabilization and subsequent management. While burrowing animals such as gophers do provide the ecosystem service of loosening and aerating soils, their presence cannot and should not be tolerated around fruit trees.



Figures 4.6 and 4.7: Gopher (left) and setting gopher traps (right).

Recommendation:
Park staff has indicated that the abundance of natural predators in the THHD orchards such as hawks, coyotes, bobcats and snakes has historically kept gopher populations in check, and that active gopher management in most orchard areas is unnecessary and unlikely given current staffing levels. It is recommended that field staff continue to monitor the gopher populations in the orchards to ensure young fruit trees are not at risk from damage.

If gopher control becomes necessary, mechanical controls such as traps are the best means of controlling gopher populations. An effective trap is the Macabee® Old Reliable which must be placed into the gopher tunnels by digging. Though time consuming, setting traps is completely non-toxic and provides positive confirmation that the pest has been mitigated. Never use toxic baits such as anticoagulants or any of the folk remedies for gophers such as flares or automobile exhaust as they introduce toxic chemicals into the environment and may cause secondary non-target pest damage.

Note: by their nature gophers disturb soils and so does the effort to control them. Digging to set the traps is unavoidable and can disturb soil to a depth of one foot or more. This practice may conflict with archaeological concerns in some orchards at THHD: consult with staff archaeologists before attempting to place any gopher traps into burrows. Setting toxic bait pellets is less invasive when done by a professional and requires the penetration of a small probe/distribution tool to find the tunnel and place the bait. Because it is less disruptive to soils, baiting may be the only acceptable method of gopher control where archaeological concerns will not allow digging in the soil.

Voles

Voles (Myodes californicus) are small, communal mouse-like rodents that live in underground burrows in woodlands and open fields. In orchard situations they are prone to chewing on tree trunks, sometimes chewing through the cambium layer of tissue and girdling the tree.

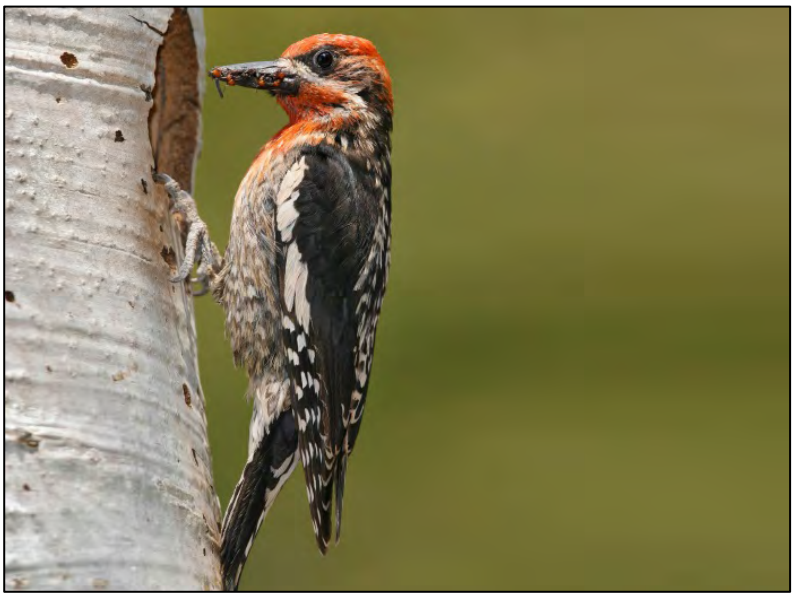
Figures 4.8 and 4.9: Vole (left) and tree guard (right).

Recommendation:

Place plastic tree collars around the base of young fruit trees that have not developed a thickened outer bark. Voles like to hide from predators in tall grass and will seek cover in it after orchards have been mown. The rings of tall, unmown grass that remains around fruit tree trunks following an orchard mowing provide a perfect cover for voles; however close to tree trunks is precisely where they should not be encouraged to seek shelter. Applying a thick layer of mulch around the base of fruit trees keeps the annual grass suppressed and discourages voles from sheltering near tree trunks.

Sapsucker Damage to Trunks and Limbs

Fruit tree trunks and limbs are often attractive to a species of bird known as red-breasted sapsuckers, which bore numerous 1/8” holes or “sap wells” into a tree’s bark to feed on the sap itself, as well as to eat insects that are also attracted to the gummy exudate. Damage from extensive sapsucker activity can destabilize a tree by hindering its internal vascular sap flow and opening up small wounds as potential entry points for disease. Extensive sapsucker activity can make a tree limb appear riddled with small holes, but in most cases a vigorous tree is able to grow and survive despite the damage. Only in concentrated tree locations will a limb become drilled to the point of girdling, which is usually irreversible and should be mitigated before historic fruit trees are lost.



Figures 4.10 and 4.11: Sapsucker damage on tree trunk (left), Sapsucker bird (right)

Recommendation:
Physical exclusion such as netting is the only truly effective method, but is not practical or most situations. Wrapping afflicted limbs or trunks with burlap is also effective and somewhat more practical but is time consuming. Frightening devices such as reflective tape, noisemakers or animatronic plastic birds of prey are generally considered ineffective.

Deer Browsing and Antler Rubbing

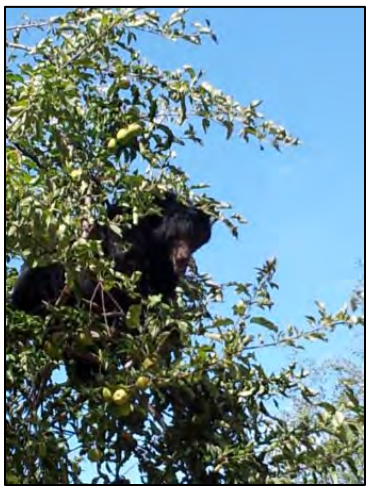
Deer are capable of causing significant stress to fruit trees in the form of browsing leaves and small branches off the tree and the act of "buck rubbing" or abrading the bark off of young trees with their antlers, which causes scarring on the tree trunk and disrupts the conduction of sap through the tree. Deer are present in the orchards at THHD and have unrestricted access to the trees.

Recommendation:
Existing historic orchard trees are generally tall and beyond deer browsing height; however, to fully protect them it may be prudent to erect an 8-foot high fence around some of the more tightly aggregated historic trees (such as the cluster near the Tower Gravesite). Individual trees can be protected with sturdy 6-foot high welded wire caging tied to metal stakes, if deer depredation and damage is a concern.

Figure 4.12: Deer browsing of lower limbs on young peach tree.

Bear Clawing and Tree Climbing

Black bears are attracted to orchards and fruit trees and can be highly destructive when they climb into the canopies and break branches in search of ripe fruit. In the process of climbing into a tree, a bear's claws can leave deep scrape marks and gouges in the tree trunk, which is a wound that allows the entry of secondary pathogens.



Recommendation:
Unfortunately, there are no good deterrents or exclusion options for bears climbing into historic fruit trees in search of fruit. Short of erecting an unsightly and impractical barrier around the entire orchard space, it may be necessary to endure bears in the orchards and mitigate their damage as it occurs. One cultural technique may be to gently shake a portion of the ripening fruit down from the trees and let it fall to the ground as a "trap crop" that minimizes a bears needs to climb into the tree itself.

Figure 4.13: Black bear in apple tree.

Biotic Stressors: Vegetation

Rootstock Suckering

Many fruit trees are composed of two separate parts that are grafted together to form one tree: the scion which produces the desirable fruit, and the rootstock which anchors the tree to the ground. Root stock and scion material alike are prone to growing excess vegetative material that can affect the form and health of a fruit tree. When the rootstock portion sends up growth from below the graft union it is called suckering. Suckers are undesirable and all such material must be pruned off promptly and routinely to preserve the health and integrity of the scion (fruit-bearing) portion of the tree. Fruit tree rootstocks are often more vigorous than scion material and will usurp plant energy that would otherwise benefit the growth of the scion (fruit bearing) part of the tree. If left unchecked rootstock suckers can outcompete and eventually kill the scion portion of the fruit tree.

Figure 4.14: Suckers emerging from pear tree rootstock.

Recommendation:
Prune off all rootstock suckers using clean, sharp hand shears or loppers as needed, or at least several times per year.

Encroaching Vegetation

Many of the extant fruit trees in the THHD orchards suffer from encroaching vegetation, particularly in the Back Field and Tenant House locations where the margins of the native woodland are gradually reclaiming the historic orchard spaces by overshading and engulfing trees on the margins, as well as in the middle of the orchard in some cases. In the Back Field, the large persimmon grove has encroached on many square feet of orchard floor that it was not historically intended to consume, and it should be removed or at least kept in check by thinning and selective removals.

Overshading is a significant stressor for many fruit trees in the THHD orchards and deprives them of ample daylight to adequately photosynthesize and grow normally. Shrubs, vines and groundcovers are another form of encroaching vegetation that must be mitigated in order to stabilize the orchards. Roots from encroaching shrubs and grasses compete with fruit trees for soil moisture and nutrients and when removed release the fruit trees from this competitive pressure.

In the THHD orchards, as in many historic orchards in California, the vegetation conditions at the time of orchard establishment may have changed radically over the intervening years: orchard margins or fields that were once naturally open or manually cleared have since been released to succession, with the surrounding forests reclaiming open ground in the absence of orchard maintenance. This is the case in all of the four orchard areas at THHD. To protect the health of the extant fruit trees as well as the integrity of the historic orchard spaces, overshading and encroaching vegetation should be removed.

Recommendation:
Remove encroaching vegetation and thin or remove overshading tree canopies from the margins of the orchard spaces. Overshaded fruit trees should be given as much light as possible, either through extensive thinning of overshading native tree foliage or in some cases the selective removal of entire trees from around the fruit trees. Fruit trees that are encroached upon by shrubs, vines or other competitive vegetation should have that vegetation cut back to beyond the root zone of the fruit tree, or at least from under the canopy of the tree.

Non-historic nut trees such as the Northern California black walnut trees should be maintained to ensure they do not spread beyond their current location. Seedling and volunteer trees, such as black walnuts, may be removed if they are non-historic, or left in place at the parks discretion if they pose no immediate encroachment to neighboring historic or reestablished compatible fruit trees.

Simply cutting down vegetation, be it shrub, vine or tree is a temporary solution to encroachment, but may not provide long-term relief. Many Californian native plant species are adapted to being severely reduced by fire or browsing and will readily spout back again from the base. For such plant species it is recommended to flush cut the plant to the ground and treat the cut stump as soon as possible with an herbicide to non-invasively kill the underground portion of the plant. Another alternative to herbicide use is implementing a grazing regime where livestock such as goats will regularly browse low-cut encroaching vegetation and keep it under control naturally.

For encroaching tree canopies particularly at the margins of the orchard spaces, enlist an ISA-certified arborist to safely perform thinning or removal of tall overshading trees. Mechanical lifts are the safest and quickest method, if they can access the trees without impacting the orchard floor, and for trees inaccessible by a lift climbing with ropes and rigging gear will be necessary.

Lichen and Moss

In shady and moist environments, some fruit trees are likely to have lichens or “Spanish moss” clinging to branches. This common lichen (it is not a moss) is the species Ramalina menziesii and will often be found hanging from the ends of fruit tree branches in wispy sheets. The presence of the moss indicates good, pure air since the sensitive moss cannot grow in polluted air.

Recommendation:
All literature on the subject states that this lichen is non-parasitic and does not injure trees; however, anecdotal observation by other orchard managers is that fruit tree growth seems weaker and thinner wherever lichen is thick. Possibly, the lichen creates moist microclimates around the branches that it inhabits, or simply overshades the foliage on those branches, leading to sparse growth in those locations. Certainly the presence of this lichen does not support or help the fruit tree and it should be removed by pulling it off by hand wherever possible.

Abiotic Stressors

Abiotic stressors are environmental, chemical or man-made in origin. Abiotic factors encompass a wide variety of potential plant stressors and can be more acutely deleterious to plant health than biotic stressors. The list below describes potential abiotic stressors in the THHD orchards:

Sunscald

Tree bark can become cracked when exposed to intense sunlight for extended periods of time. Sunscald is generally worse on young trees with thin bark layers, but can also damage limbs of older trees as well. Tree bark that is damaged by sunscald develops cankers that open the tree up to secondary infection by insects and/or fungi. Typically, this occurs on sun exposed surfaces facing southwest or upwards. Trees that have lost their leaf canopy in the summer due to disease or depredation are particularly susceptible and should be protected through cultural means.

Recommendation:
Painting susceptible tree trunks and scaffold limbs with white latex paint (full strength or diluted with water 50/50) acts as a sunscreen that reflects the damaging sunlight and protects the tree bark and underlying cambium from scalding. Another sunscald prevention technique is to wrap tree trunks and limbs with white gossamer tree wrap, which not only reflects sunlight but forms a protective barrier against boring insects and birds such as sapsuckers.

Figure 4.15: Young fruit tree painted white to protect tender bark.

Drought

Prolonged periods of drought (such as has occurred in California the past few years) can have serious negative effects on historic fruit trees and will inevitably hasten their decline if not stabilized. Even historic fruit trees in the THHD orchards that have adapted to a dry-farming regime (i.e. not supplied with supplemental irrigation in the summer time) will not survive extended periods of drought if soil moisture levels drop below the trees ability to access sub surface groundwater. Fortunately for the orchards at the THHD, most of the orchards were historically situated in level, low-lying areas near streams so these trees may be more resilient to drought than trees in other locations.

Recommendation:
Supply trees with supplemental irrigation at least once or twice during the driest summer months. Water deeply (soil should be moist to a depth of 2-3 feet) and broadly under the entire canopy of each tree to ensure good distribution uniformity. Water for Camden House Yard historic trees can be supplied using the existing redwood water tank system, and for trees in the Back Field, Tenant House and French Gulch Field water will need to be brought in via truck and distributed manually by a hose or water pump until historic ditch irrigation systems are rehabilitated.

Flood

Placing fruit orchards in low-lying areas near streams may also expose them to being inundated during extreme storm events at the THHD. One such event was recorded in the ranch diary for June 1941 when Willow Creek and Crystal Creek became swollen, causing extensive flood damage.

Recommendation:
Stabilizing the orchards and trees from flood events at the THHD presents a difficult challenge and may be beyond the scope of this document. It will be prudent to future planning efforts to recognize this potential stressor and situate orchard trees accordingly. Plant trees on higher ground when possible or choose species such as pears and quince for the lower areas, as they are able to withstand saturated soils better than other species. Plant new trees on elevated mounds of soil to prevent water from collecting around the trunks and promoting conditions for disease.

Fire

The potential for wildfire at Whiskeytown NRA is omnipresent. One particular area of concern is the French Gulch Field where highway 299 and Trinity Mountain Road intersect, which has a history of intentional and accidental human-caused fires emanating from this location in the past. The greater threats to orchards at THHD relative to wildfire are the characteristically long, hot and dry summers that increase the combustibility of dry fuels in and around the orchards. Current climate models predict even longer, hotter and drier summers so the threat of fire and its potential to destabilize orchard conditions is a significant concern.

Recommendation:
Remove encroaching vegetation from under and around fruit trees and along roadway shoulders where human-caused fires are most likely to occur. Maintain orchard floor vegetation to a height of 6” or lower to reduce the combustible fuels underneath and around fruit trees and to decrease a fire’s intensity and potential to harm fruit trees. Encroaching vegetation underneath or near a tree’s canopy can act a as a “fire ladder” that allows flame to climb upwards and increased the potential for irreversible damage to the tree canopy.

Structural Integrity

Hollow or Broken Trunks and Limbs

Many of the historic fruit trees associated with the THHD exhibit structural defects in their architecture such as hollow or broken trunks and limbs: such defects should be stabilized as soon as possible. The presence of these architectural defects indicates that the tree may be compromised at any time from falling over or breaking apart due to an inability to support the weight of branches and fruit. Structurally unsound trees are also prone to failure under the load when wildlife such as bears or deer, or even visitors try to climb the tree to harvest fruit. Stabilizing structurally unsound parts of a tree is an important and relatively simple strategy for prolonging the life of aged trees.

Recommendation:
Wooden or metal props can be used to brace unsound sections and relieve them of stress. For aerial sections too far from the ground for a prop to reach, use metal cable inside a section of garden hose, or purchase specialized dynamic tree cable to tether the unsound limb(s) together or to a sound section of tree.

Leaning Trunks

Over time fruit trees may develop significant leans to their trunks which can destabilize the entire structure and cause premature failure. Fruit trees that are overshaded by taller trees may develop leans as they reach for more light, or they may lean because their roots have lost the ability to anchor the tree to the soil.

Recommendation:
Brace the leaning fruit tree trunk against the ground using wooden supports adequate for the size and weight of the trunk. Dig a small depression under the support to anchor it and carefully wedge it under the leaning trunk. Wind may cause movement in the tree and it may be necessary to tie the support to the tree trunk if there is a chance it will fall out during tree motion. Avoid scraping or damaging the tree bark: use thick rubber or plastic as a cushion to protect the tree.

Unbalanced Canopies

For the same reason that leaning trunks may cause premature failure of a tree, unbalanced canopies can put stress upon the scaffold limbs or trunk and cause a destabilization of the entire tree's architecture. Many of the historic trees in the orchards at Whiskeytown exhibited unbalanced canopies, especially those associated with overshading along the southwestern edge of the Back Field.

Recommendation:
Correct unbalanced fruit tree canopies through structural pruning. Over a period of several years, selectively prune the mass of existing canopy to redirect the center of gravity over the

main trunk as much as is possible. Do not make major or drastic cuts all at once: instead stagger the removal of smaller diameter branches that pull the canopy outward and retain those branches that grow in the desired direction. The goal is to rebalance the canopy and nudge its center of gravity over the main trunk or scaffold limbs.

Orchard Cultural Practices

Cultural practices with regards to orchard stabilization are those correctable human activities that actively or inadvertently place stress on the health of the fruit trees, causing them to decline prematurely.

Trunk Damage from Power Equipment

Power equipment such as mowers and stringline trimmers (aka weed whackers) are highly useful tools for vegetation management in orchards, yet they also have the ability to do considerable damage to tree trunks and exposed roots if not used carefully. When plastic trimmer blades or metal mower blades contact tree trunks or exposed roots the damage is immediate, and irreversible. Such wounds to the cambium tissue of a tree open it up to infectious agents such as insects, fungi and bacteria and compromise the trees ability to conduct nutrients and photosynthates between roots and canopy. This type of tree damage is entirely operator-involved and is also very avoidable if proper precautions and practices are followed.

Figure 4.16: Fruit tree trunk damaged by a weed whacker.

Recommendation:
When using power equipment such as stringline trimmers in the orchard avoid trimming any closer than three feet to tree trunks to avoid accidentally nicking and damaging the trunk. Installing plastic collars around fruit trees provides a decent level of added protection from stringline trimmers in the event of accidental contact between trunk and blades.

Improper Pruning

Historic orchard pruning requires an understanding of tree character and structural pruning that can be substantively different from commercial orchard pruning practices. Improper or careless pruning is a cultural stressor that can deform the character of a historic fruit tree or

worse: send it into a spiral of decline. Historic fruit trees need to be pruned by a skilled orchardist who understands the limit of how much material can be removed from a given tree in a given year, and who also possesses knowledge of historic fruit tree forms.

Recommendation:
All orchard pruning at the THHD should be done by an orchardist or certified arborist who is versed in the nuances of historic orchard preservation maintenance and stabilization practices. At minimum, pruning in the THHD orchards shall adhere to the best industry standards described in the document "Tower House Historic District Fruit Tree Pruning, Mulching and Site Clearing" (see Supplemental Information), and the ANSI A300 part 1 industry standards for pruning (see http://tcia.org/business/ansi-a300-standards/part-1). Refer to the sections entitled Pruning to Stabilize Fruit Trees and Structural Pruning below for further information.

Soil Compaction

Tree health can be compromised when the soil over the root zone is compacted by vehicle and equipment traffic. The effects of compaction are magnified when the soil is moist or saturated and mitigating compacted soils can take many years to achieve. Trees have the majority of their fine roots within 12" of the surface, and soil compaction in this zone hinders a trees ability to exchange gas and "breathe", thus destabilizing it and hastening its demise. At the THHD there is no serious evidence of soil compaction in the orchard generally, other than within the established dirt road and trail corridors.


Figure 4.17: Mulch protects root zones from compaction.

Recommendation:
Fruit trees that are near roadways or trails (Camden House Yard; Back Field; Tenant House) should have their root zones protected by a thick layer of mulch, up to 4" in depth. Mulch helps cushion the effects of traffic and over time with repeated applications helps reduce compaction by increasing soil tilth and aeration through biotic activity.

ORCHARD STABILIZATION TECHNIQUES

Orchard stabilization employs a specific set of skills and techniques to achieve a successfully stabilized condition. Often, these actions are the first undertaken to address health stressors in a historic orchard. All of the following techniques described for orchard stabilization are the same as those used for preservation maintenance. These techniques will be revisited and expanded upon later in the document.

Pruning to Stabilize Fruit Trees

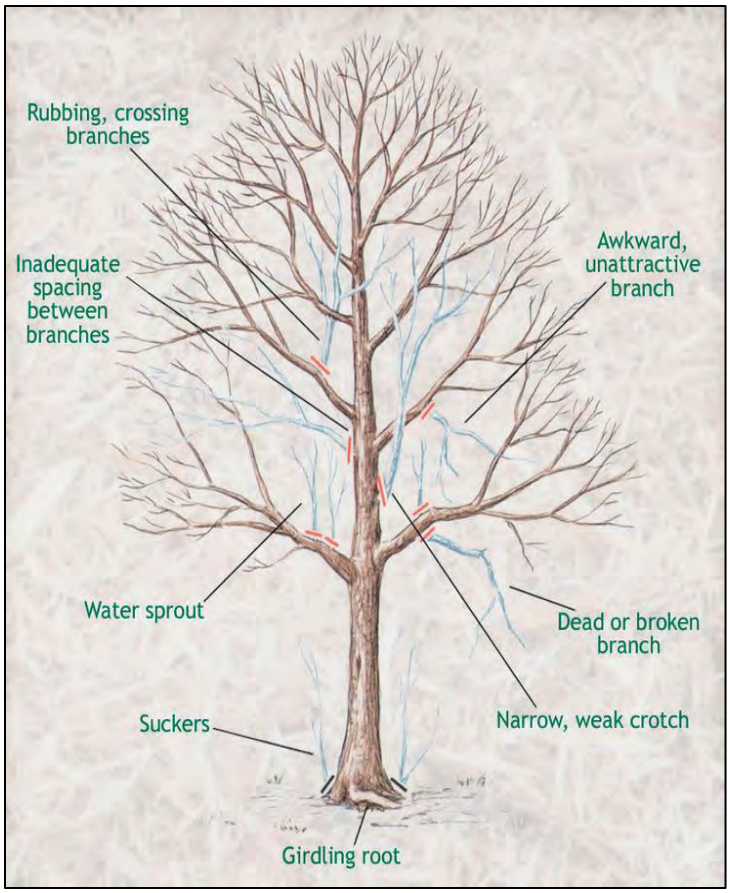


Figure 4.18: Pruning trees for good health and structure.

Pruning is the intentional and methodical removal of material from a tree, and is among the most tactile and intimate of orchard practices. There is arguably no better way to become familiar with historic fruit trees than to spend many hours considering how each pruning action will affect the shape and health of a tree. At times, pruning is viewed as a form of 'tree surgery', a set of techniques that can correct certain structural issues. For this reason, using the correct pruning techniques is critical.

Historic trees in the THHD orchard areas should be pruned to re-establish, enhance or retain the historically appropriate character of the tree, rather than to create a different or contemporary style of tree that might be functional but would not convey the correct historical feeling of the orchards.

In the French Gulch Field, Camden House Yard, and Back Field locations, the historically correct fruit tree form should be "open-bowl". Fruit trees at the Tenant House may be pruned to form a high-headed central leader or a modified central leader, to illustrate the difference between a nineteenth century commercial orchard and a vernacular orchard.

Moderate pruning of an old tree has a stimulating effect on trees by altering the chemistry and flow of nutrients within the tree canopy. This typically leads to increased new growth and a need to continue pruning year after year, hence the saying: "The more you prune, the more you will need to prune". Removing any tree material other than dead, diseased or

damaged wood will often result in the production of new growth, even with old trees that have reached their mature size.

Too much pruning at one time will either send the tree into decline or shock it into producing a flush of new growth that must be pruned out. Altering a mature tree's canopy causes a biochemical response that often results in new growth. Stabilization pruning cuts must be done gradually, especially on old or senescent trees, to avoid over stimulating the tree into producing excessive new growth, or sending it into a death spiral. Never remove more than 25% of a fruit tree's live canopy in one year. Anticipate taking three to four years to fully clean or stabilize a large tree by pruning.

Stabilization pruning calls for the removal of: dead, diseased or damaged wood, root suckers and watersprouts. All of the following may be removed at any time of year:

- Dead wood clutters the interior canopy, harbors disease agents and insects, is an impediment to wound closure and may be hazardous to people below. Prune deadwood just outside the point of living tissue. Do not cut into living tissue. Deadwood may be removed any time of the year.

- Diseased wood should be cut 6"-12" below the point of infection, or as far as practical from the diseased area. Sterilize pruning tools with isopropyl alcohol (spray or wipe on) to prevent vectoring disease between trees. A 10% bleach solution may be used but this will rust tools and so be sure to oil them afterwards. A flame is also an excellent sterilizer but must be used with caution. A small butane or propane torch is a quick and efficient way to sterilize tool blades.

- Damaged wood that is cracked, split or abraded is of limited value to the tree and should be removed, even if those damaged branches still produce leaves and fruit. It is better to remove a damaged limb and retrain a more auspicious watersprout from an adjacent limb, than to abide an inferior or damaged one. Damaged wood should be removed sooner rather than later but is best removed during the dormant season, when the tree is less likely to respond with a flush of new growth.

- Suckers are vigorous new shoots that arise from below the fruit tree graft union, usually located just a few inches above the soil. Rootstock sucker growth can deprive the fruiting portion of a tree of energy, so suckers must be removed often, whenever they arise.

- Watersprouts are new shoots that arise from the trunk or limbs of the tree above the graft union. Since they are part of the desired fruiting part of the tree they are less pernicious than suckers, but they will utilize energy in the tree that might otherwise be used by the established fruiting branches. Remove watersprouts if there is no anticipated need for them.

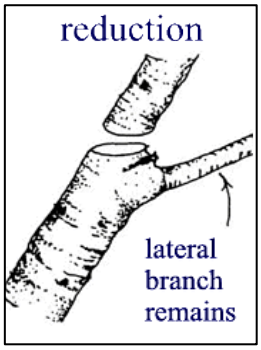
Structural Pruning

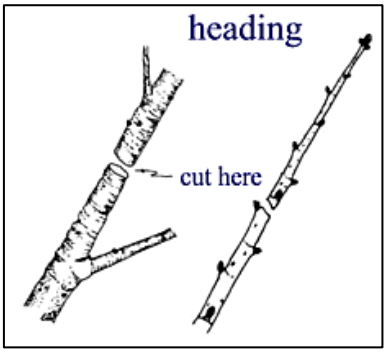
Unlike stabilization pruning (which emphasizes tree health and vigor), the goal of structural pruning is to develop strong scaffold limbs arising from the tree trunk(s) that will support the rest of the tree canopy, leaves and fruit. Structural pruning is best done early in the tree's life rather than later, but historic fruit trees have typically been neglected for so many years that significant pruning is required to restore the former scaffold structure.

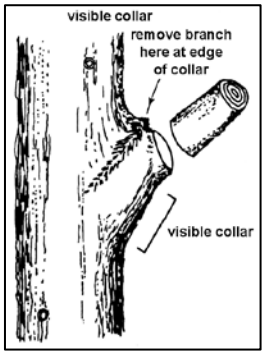
Pruning for structure means consciously retaining or removing branches and stems to achieve a specific tree shape or form and is employed during and after stabilization to improve fruit tree health. It is best performed by someone experienced in training fruit trees and preferably during the winter dormant season.

The three types of structural pruning cuts for fruit trees include:

- Reduction cut (cutting a larger branch back to a smaller branch)
- Heading cuts (making a branch shorter by cutting it back)
- Removal cuts (complete removal of a branch back to the trunk or scaffold limb)







Figures 4.19, 4.20 and 4.21: Three types of pruning cuts: Reduction, Heading and Removal.

Each of the above pruning cut types has its own merit and they should be used as necessary to improve tree structure and direct future new growth to achieve a stable scaffold structure.

The three cut types can be used to achieve the following goals within the canopy of a tree:

- Thinning of excessive growth
- Removal of rubbing or crossing branches
- Reduction of tree height
- Raising of low-hanging tree limbs
- Creating new scaffold limbs

Thinning the interior of a tree canopy improves the canopy structure and serves to increase light. Generally, major branches that support a significant portion of the tree canopy should not be removed from historic trees. It can be more detrimental than beneficial to an old fruit tree to fully restore its structure if the tree has acquired its own character through years of unstructured growth. It is acceptable to allow old fruit trees to retain some patina of age when structural safety and health issues are satisfied.

Removal of rubbing branches is a stabilization pruning action intended to prevent branch abrasion and wounding that may provide an entry point for insects and disease. Wind, gravity and expanding tree growth can all cause branches to rub together or even fuse together, leading to poor tree structure and inevitable bark damage. Where two or more branches rub together, one should be selected as the dominant branch and the other one removed. Other factors may influence which branch is kept and which is removed, but the main goal of removing rubbing branches is to decrease the capacity for plant injury and allow every branch to grow and move unobstructed to the greatest degree possible.

Removal of crossing branches that are likely to become rubbing branches in time is advisable. Select the least desirable branch and remove or reduce as necessary. Neglected fruit trees often create a canopy with long, wispy branches originating on one side of the tree and growing through the center to the other side of the canopy resulting in an “umbrella” or “muffin top” form. This dense, intertwined growth inhibits air circulation and light penetration through the canopy.

Raising lower limbs or reducing the height of taller limbs can be achieved through pruning, and is often necessary when fruit trees have been neglected. Raising unwanted lower limbs will allow better access for mowers or brush cutting equipment, and reducing the height of a tall tree will facilitate future pruning and fruit harvesting efforts.

Creating new scaffold limbs is possible with old fruit trees that are missing one or more primary scaffold branches or have significant gaps in the canopy. The process may take several years or more but with careful structural pruning using the types of cuts discussed above, young new growth can be trained to fill in areas where major limbs are missing. Tree health is directly related to photosynthesis, and a larger canopy is directly proportional to an increased capacity for sugar and carbohydrate production.

Mechanical Stabilization

Fruit trees with conspicuous structural weaknesses should be mechanically stabilized using props, braces or cabling techniques. This type of stabilization requires a variety of hardware and materials readily available at most hardware stores. Safety is paramount when working beneath structurally defective trees to prevent accidental failure or injury.

Propping is a simple, effective and non-invasive means to stabilize leaning trunks or compromised scaffold branches. Sometimes a piece of lumber such as a 2” x 4”, cut to size and notched at one end, is sufficient to support a leaning trunk or limb.

Figure 4.22: Propping provides support for leaning trunks.

Tree branches are dynamic and shift their weight. Branch shift can happen suddenly such as in a windstorm, or gradually as branches are weighed down by seasonal fruit loads and rise again after harvest. Consider potential shifting when determining the size and placement of a solid prop. To prevent the prop from falling out, cut it slightly longer than needed and wedge it between the branch and the soil. Remove any debris, grass or sod from where the prop is to be placed and scrape away some soil to create a divot for the prop to sit in. Get assistance to push up gently on the branch while slipping the prop into place at a stable angle. Use a mallet to pound on the bottom end if necessary to nudge the prop into place. A secure prop should be absolutely immobile when pushed from the side.

A brace is a solid metal threaded rod used to connect two adjacent leaders together where there is a split or crack at their union. Bracing creates a rigid connection between two independent parts of a tree so they move as one. Bracing is invasive as a hole must be drilled through each leader to accommodate the brace rod. It should only be considered if the consequences of limb failure are a hazard to people or to the longevity of the fruit tree. Bracing should be done with structural pruning to alleviate stress on the braced section. Cabling allows two or more limbs to move independently but it does limit the range of motion to that of the length of cable used. Cabling is used to stabilize adjacent limbs with weak or cracked unions or to support a heavy limb by joining it to a stronger limb. Traditionally, cabling was invasive to the tree and required hardware such as eye bolts and lag bolts, however newer products and methods exist (such as the Cobra Cable) that are non-invasive and are now the preferred method for stabilizing fruit trees. These modern cabling systems secure to the outside of the joined limbs and create a dynamic tension between them.

It is highly recommended that someone with the appropriate skills, equipment and experience (such as a certified arborist) perform bracing and cabling.

Stabilizing Wildlife and Mechanical Damage

Mechanical damage to trees entails wounding or breakage of roots, trunks, limbs and branches and is a major threat to tree longevity. Wounds to the bark and cambium layer may affect a tree’s vascular system by disrupting its ability to transport nutrients and photosynthates and are also potential points of entry for disease and pests.

Mechanical damage can come from a number of sources but is mostly promulgated by animals such as rodents, deer, bear or cattle that chew scrape and rub bark off trunks and limbs. Human activity is also a major cause of mechanical damage, such as careless equipment use. Tools such as weed whackers and mowers can easily scar tree trunks and should not be used within three feet of a fruit tree trunk.

Exclusionary fencing is the best method for keeping animals and equipment from damaging orchard trees. Erecting a perimeter fence around select orchard spaces at THHD would protect the trees in these orchards from animals; however, such perimeter fences are costly and can be aesthetically obtrusive for visitors and staff. There may also be archaeological issues to consider as well when fence posts are installed in the ground.

Figures 4.23 and 4.24: Fencing individually (caging) or all together protects trees from damage.

An alternative to a single perimeter fence are individual sturdy welded-wire cages around each tree, however one disadvantage of using individual cages is the extra time and effort required to move or remove them to access the tree to prune, harvest, mulch or pull weeds.

Generally, small vertebrate pests such as gophers and voles can be very harmful to fruit trees and can kill young trees by chewing the root systems back to the tree base. Gopher mounds were observed very near (within the drip lines) of several young fruit trees in the Camden House Yard, and mounds were also observed in the other orchard spaces as well; however, observation by park managers indicates that these vertebrate pests are not a major issue in the orchards at the THHD and are likely kept in check naturally by a healthy abundance of predators. If necessary, manually setting traps is the most effective means of gopher control. Traps have the benefit over poisons of being non-toxic, but are time consuming to set and empty. Vegetation management is the best practice for deterring vole damage on young fruit trees, since trapping is not effective. Voles seek tall grass in which to hide from predators and will harbor in grasses around fruit tree trunks, especially if the orchard floor is mowed low while grass is left tall around tree trunks.

Orchard Floor Stabilization

Stabilizing conditions on the orchard floor is an important step to relieving health stressors affecting THHD fruit trees. Encroaching vegetation and annual grasses compete with fruit trees for available nutrients and soil moisture. In addition, many plants exude allelopathic (growth-inhibiting) chemical compounds from their roots that can hinder the growth of fruit trees.

Grass should be maintained at a 6" height or less. Avoid cutting closer than three feet from fruit tree trunks with mowers or weed-eating equipment to prevent scarring the trunk. Mowing is recommended in orchards rather than tilling, which disturbs the soil structure; damages tree roots and may also disturb subsurface archaeological resources.

Remove encroaching shrubs, vines and volunteer trees to reduce root competition. If the encroaching trees or shrubs are within the drip-line of the fruit tree avoid digging them out with tools that can damage tree roots. Robust vegetation such as small trees and shrubs can be removed in one of several ways*:

Pulling them out of the ground manually with a weed wrench;
Pulling them out using a chain connected to a tractor;
Digging them out with shovel or Pulaski, or cutting them flush to the ground with a handsaw or chainsaw and treating the cut stump with herbicide to prevent re-sprouting.

*Note: orchard activities that require ground disturbance must be approved by the park archaeologist or resource manager prior to work. The capacity for damage to sub-surface archaeological resources must be evaluated when mechanical or chemical vegetation removal is considered. In archaeologically sensitive areas of the orchard, the best vegetation management strategy may be flush cutting and stump treatment which is minimally invasive, rather than activities that involve ground disturbance.

Herbicide use is generally discouraged used around fruit trees due to the risk of harming the tree itself. But when applied carefully and precisely at the right time, herbicides can be an effective and efficient way to manage grass vegetation. It is a particular benefit for trees to control grass within the root zone three feet from the trunk.

Only qualified applicators should apply herbicides and care must be taken to spray herbicides when conditions are favorable (i.e. dry, no wind). Herbicide eliminates the need to use power equipment close to the trunk. However, mulching serves the same purpose and is more beneficial for soil health.

Mulch is any soil covering (organic, synthetic, or stone) that inhibits grass and weed growth and retains soil moisture in the fruit tree root zone. Mulch is not incorporated into the soil as an amendment but left as a surface layer. The appropriate mulch for orchards is a coarse-textured wood chip such as produced by a commercial wood chipper. Wood chips are an excellent choice for weed suppression and moisture retention when applied in a 4" thick layer within the drip line. As wood chips break down they create a fungal duff layer that

encourages microbial activity in the rhizosphere and increases the release of micronutrients to tree roots. Wood chips can be combined with compost to create more nutritional mulch.

A major benefit of mulching within the drip line of fruit trees is a significant reduction in the need to cultivate, mow, weed whack or spray herbicides near the trunk. It also discourages voles from hiding in grass near the trunk and chewing tree trunk bark. Mulch eventually disintegrates and should be replenished every couple of years. As with compost, keep mulch from contacting the fruit tree trunk. Apply bark mulch 4" thick to a distance of at least 2 feet from the trunk or as far as the canopy extends and reapply mulch as needed to suppress weed growth. Avoid mulch of unknown origin, such as material from tree trimming services. This may contain weed seeds or invasive plant parts that can spread into the orchard. Create mulch or purchase it from a reputable source.

Propagation and Germplasm Conservation

Germplasm conservation is recommended as part of the scope of stabilization. Germplasm conservation preserves the specific genetics of individual trees in the orchard, and in the event that this tree-specific genetic information is needed in the future the material can be retrieved and utilized. Plant conservation can be achieved by several means:

- By propagating known historic cultivars in the orchards through grafting and growing the new trees in the orchards as clones of the parent tree.

- Through a living collection of trees representing all of the genotypes in the orchard and maintained off- site, such as in a plant nursery.

- Through cryogenic means, involving use of the national system of USDA National Plant Germplasm Repositories. Cryogenically conserved germplasm is plant tissue held at sub-zero temperatures in liquid nitrogen, so that it can be thawed at any time later and used to propagate replacement trees in perpetuity.

Of these, propagating through grafting is the most practical. Many of the historic trees at the THHD have already been propagated through grafting and planted in the nursery or fruit tree staging area associated with the Camden House Yard. Propagating genetic clones of historic fruit trees for conservation and future replacement uses an ancient technique known as grafting. Most cultivated fruit trees consist of two individual trees joined, or 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.

Combining two different trees takes advantage of the unique strengths of each: for example, the scion of one tree will have desirable fruit while the rootstock of another may exhibit disease resistance. The same technique allows historic orchard managers to conserve desirable historic trees by grafting scions of the historic trees onto rootstocks of compatible species. The resultant tree will be the same as the parent tree for all practical purposes. For

the sake of historical accuracy it is important to choose the appropriate rootstock, as dwarf clonal rootstock lines will affect the ultimate size of the grafted tree.


Figures 4.25 and 4.26: Rootstock bundle (left) and grafted fruit tree rootstock and scion (right).

The essential steps involved in propagating and grafting a fruit tree are:

1. Take scion cuttings from the parent tree in winter, when the tree is dormant. Seek 1-2 year old shoots and twigs that are the diameter of a pencil or less.

2. Place the scion cuttings sealed in a sealable plastic bag along with a damp paper towel and store in the refrigerator until springtime.

3. Order rootstock from a supplier during winter, to have it delivered in time for spring. Suppliers typically sell rootstock in bundles of 100 or more (finding smaller quantities to purchase may be difficult).

4. Upon delivery, temporarily plant the rootstocks in pots or “heel” them in to the soil and water well.

5. Graft together scions from the refrigerator with rootstocks of matched diameter and plant or heel in until the graft union is formed and the two parts have fused together.

6. Grow the newly formed tree for at least one year under nursery conditions before planting in the orchard to ensure the viability of the graft.

To send germplasm samples to a repository, each set of cuttings should be placed in a labeled, zippered plastic bag with damp tissue paper, and then refrigerated until packaging and express mailing to the USDA Germplasm Repository can occur. Conservation services can be provided at the USDA National Plant Germplasm Repositories (NPGR) through the development of a cooperative agreement.

Hazardous Trees

It must be emphasized that public safety considerations are paramount where trees are concerned. Any tree in or near an orchard that presents an imminent threat to human safety must be cordoned off with protective barriers, dismantled to a point where it is no longer a hazard or if necessary through lack of mitigation options, completely removed.

The degree of hazard that a tree poses is a calculation of the condition of the tree, likelihood of failure and the presence of a target (i.e. people, objects, animals or cultural resources). Taking this into consideration, the majority of fruit trees at THHD are unlikely to pose a significant and persistent hazard, either because they are not tall or large enough to be much of a threat, or they exist in a location that does not contain permanent targets. To prioritize hazard orchard tree mitigation at the THHD orchards, focus first on those trees that are tall and/or structurally weakened, and that exist near regularly travelled trails or pathways (such as the Tower Gravesite Trail, Lower Crystal Creek Ditch Trail). A trained arborist can assist with making these hazard tree determinations.

SUMMARY

Priorities for stabilization actions are the removal of stressors that pose the greatest and most immediate threat to the health of the fruit trees.

- Primary fruit tree stressors in the THHD include:
- Encroaching vegetation
- Fireblight
- Drought
- Bears

The techniques for orchard stabilization are frequently the same as those used for regular orchard preservation maintenance. The difference is in their application. Stabilization calls for immediate targeted actions to halt declining tree health, while preservation maintenance, described in the next section, is ongoing and cyclical, seeking to improve and extend the life of fruit trees while retaining their historic character

Fruit Tree Stabilization Priorities in THHD

Tree Condition:	Tree ID:	Species:	Cultivar:
Poor	**BF-Ap-001**	Apple	unknown
Poor	**BF-Ap-002**	Apple	unknown
Poor	**BF-Ap-003**	Apple	unknown
Poor	**BF-Ap-003b**	Apple	unknown
Poor	**BF-Ap-004**	Apple	unknown
Poor	**BF-Ap-006**	Apple	unknown
Poor	**BF-Ap-007**	Apple	unknown
Poor	**BF-Ap-008**	Apple	'Colby Baldwin'
Poor	**BF-Ap-009**	Apple	unknown
Poor	**BF-Ap-010**	Apple	'Winesap'
Poor	**BF-Ap-011**	Apple	unknown
Poor	**BF-Ap-012**	Apple	unknown
Poor	**BF-Ap-016**	Apple	unknown
Poor	**BF-Ap-017**	Apple	unknown
Poor	**BF-Ap-022**	Apple	unknown
Poor	**BF-Ap-023**	Apple	unknown
Poor	**BF-Ap-024**	Apple	unknown
Poor	**BF-Ch-003**	Sweet Cherry	unknown
Poor	**BF-Ch-004**	Cherry	unknown
Poor	**BF-Pr-001**	Pear	unknown
Poor	**BF-Pr-002**	Pear	unknown
Poor	**CY-Ap-001**	Apple	unknown
Poor	**CY-Ap-002**	Apple	unknown
Poor	**CY-Ap-003**	Apple	unknown
Poor	**CY-Ap-004**	Apple	unknown
Poor	**CY-Ap-009**	Apple	unknown
Poor	**CY-Ap-014**	Apple	unknown
Poor	**CY-Ap-015**	Apple	unknown
Poor	**CY-Ap-016**	Apple	'White Winter Pearmain'
Poor	**CY-Ap-020**	Apple	unknown
Poor	**CY-Ch-001**	Cherry	unknown
Poor	**CY-Pr-001**	Pear	unknown
Poor	**CY-Pr-005**	Pear	unknown
Poor	**FG-Ap-001**	Apple	unknown
Poor	**FG-Ap-003**	Apple	unknown
Poor	**FG-Ap-007**	Apple	unknown
Poor	**FG-Ap-008**	Apple	unknown
Poor	**FG-Ap-009**	Apple	unknown
Poor	**FG-Ap-011**	Apple	unknown
Poor	**FG-Ap-012**	Apple	unknown
Poor	**FG-Ap-013**	Apple	unknown
Poor	**FG-Ch-002**	Sweet Cherry	unknown
Poor	**FG-Ch-003**	Cherry	unknown
Poor	**FG-Wa-001**	Walnut	N. Calif. Black Walnut
Poor	**FG-Wa-002**	Walnut	Black walnut
Poor	**FG-Wa-004**	Walnut	Black walnut
Poor	**FG-Wa-006**	Walnut	Black walnut

Poor	**FG-Wa-012**	Walnut	Black Walnut
Poor	**TH-Ap-001**	Apple	Reinette Franche
Poor	**TH-Ap-002**	Apple	unknown
Poor	**TH-Ap-003**	Apple	unknown
Poor	**TH-Ap-006**	Apple	unknown
Poor	**TH-Ap-007**	Apple	unknown
Poor	**TH-Ap-011**	Apple	unknown
Poor	**TH-Ap-014**	Apple	unknown
Poor	**TH-Ap-015**	Apple	unknown
Poor	**TH-Ap-016**	Apple	unknown
Poor	**TH-Ap-017**	Apple	unknown
Poor	**TH-Ap-018**	Apple	unknown
Poor	**TH-Ap-019**	Apple	unknown
Poor	**TH-Ap-020**	Apple	unknown
Poor	**TH-Ap-021**	Apple	unknown
Poor	**TH-Ap-022**	Apple	unknown
Poor	**TH-Ap-023**	Apple	unknown
Poor	**TH-Ap-024**	Apple	unknown
Poor	**TH-Ch-001**	Cherry	unknown
Poor	**TH-Ch-003**	Cherry	unknown
Poor	**TH-Ch-005**	Cherry	unknown
Poor	**TH-Ch-010**	Cherry	unknown
Poor	**TH-Ch-011**	Cherry	unknown
Poor	**TH-Ch-012**	Cherry	unknown
Poor	**TH-Ch-013**	Cherry	unknown
Poor	**TH-Ch-014**	Cherry	unknown
Poor	**TH-Ch-016**	Cherry	unknown
Poor	**TH-Pr-002**	Pear	unknown
Fair	**BF-Ap-013**	Apple	unknown
Fair	**BF-Ap-015**	Apple	unknown
Fair	**BF-Ap-019**	Apple	unknown
Fair	**BF-Ap-020**	Apple	unknown
Fair	**BF-Ap-021**	Apple	unknown
Fair	**BF-Ch-001**	Cherry	unknown
Fair	**BF-Ch-002**	Sweet Cherry	unknown
Fair	**BF-Pr-003**	Pear	unknown
Fair	**BF-Pr-004**	Pear	unknown
Fair	**BF-Ap-025**	Apple	unknown
Fair	**CY-Ap-008**	Apple	'Derman Winesap'
Fair	**CY-Ap-011**	Apple	'Collamer Twenty Ounce'
Fair	**CY-Ap-012**	Apple	unknown
Fair	**CY-Ap-013**	Apple	'Jonathan' or related cultivar
Fair	**CY-Ap-017**	Apple	unknown
Fair	**CY-Ap-018**	Apple	unknown
Fair	**CY-Ap-019**	Apple	'Lady'
Fair	**CY-Ap-027**	Apple	unknown
Fair	**CY-Ap-039**	Apple	unknown
Fair	**CY-Ap-041**	Apple	unknown
Fair	**CY-Ap-047**	Apple	unknown

Fair	**CY-Ap-049**	Apple	unknown
Fair	**CY-Pr-002**	Pear	unknown
Fair	**CY-Pr-003**	Pear	unknown
Fair	**CY-Pr-006**	Pear	unknown
Fair	**CY-Pr-007**	Pear	unknown
Fair	**FG-Ap-002**	Apple	unknown
Fair	**FG-Ap-010**	Apple	unknown
Fair	**FG-Pr-001**	Pear	unknown
Fair	**FG-Qu-001**	Quince	unknown
Fair	**TH-Ap-005**	Apple	unknown
Fair	**TH-Ap-008**	Apple	unknown
Fair	**TH-Ap-009**	Apple	unknown
Fair	**TH-Ap-010**	Apple	unknown
Good	**BF-Ap-014**	Apple	unknown
Good	**BF-Pr-005**	Pear	unknown
Good	**BF-Ps-001**	Persimmon	unknown
Good	**CY-Ap-026**	Apple	unknown
Good	**CY-Ap-029**	Apple	unknown
Good	**CY-Ap-033**	Apple	unknown
Good	**CY-Ap-037**	Apple	unknown
Good	**CY-Ap-045**	Apple	unknown
Good	**CY-Ap-048**	Apple	unknown
Good	**CY-Gr-001**	Grape	unknown
Good	**CY-Wa-001**	Walnut	unknown
Good	**FG-Gr-001**	Grape	unknown
Good	**FG-Wa-003**	Walnut	Black walnut
Good	**FG-Wa-005**	Walnut	Black walnut
Good	**FG-Wa-007**	Walnut	Black walnut
Good	**FG-Wa-008**	Walnut	Black Walnut
Good	**FG-Wa-011**	Walnut	unknown
Good	**TH-Ch-004**	Cherry	unknown
Good	**TH-Gr-001**	Grape	unknown
Good	**TH-Pr-001**	Pear	unknown

Table 4.1: Fruit tree stabilization priorities in the THHD.

PRESERVATION MAINTENANCE

Introduction

Many different techniques are employed to maintain fruit trees and orchards, including: pruning mowing, brushing, aerating, irrigating, fertilizing, and mulching. Integrated Pest Management can be used to control pests and diseases in the orchard and fruit thinning can improve fruit harvest. As fruit grows, it may be necessary to prop fruit laden branches in order to prevent damage. Finally, fruit should be harvested using proper techniques that do not damage the tree. When used in combination, these practices will improve the condition of trees in the orchard and promote tree health and longevity.

Pruning

Goals of Pruning

The form of a fruit tree is shaped by the sum total of all the pruning cuts applied over its lifetime. A regularly pruned fruit tree may be old and yet still retain its intended shape: conversely a young fruit tree that did not receive early structural pruning will have an entirely different form. Pruning the historic fruit trees associated with the THHD shall be performed in a manner consistent with preserving their historic character.

The non-stylistic, historic character of the following fruit tree species are:

- Apple: open vase style, tall, open and broad
- Pear: open vase style, tall, narrow and upright
- Plum: open vase style, shorter than apple, open and broad
- Quince: unpruned multi-stemmed shrub
- Sweet cherry: central leader or modified central leader, tall, narrower and upright
- English walnut: modified central leader, tall, open and broad

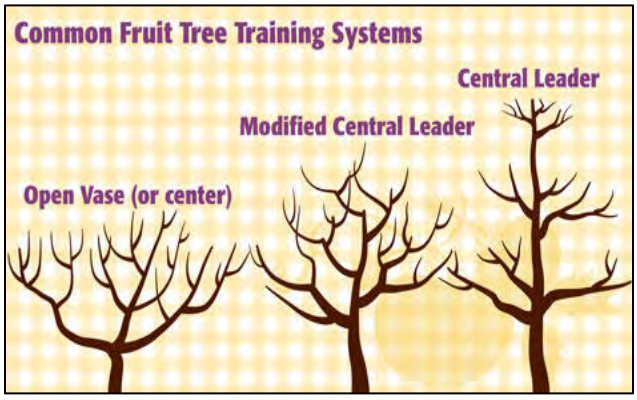


Figure 4.27: Three historic fruit tree training styles.

Appropriate pruning requires familiarity with the intended (historic) tree character, the types of pruning cuts, where and when to use them, and how the tree responds to each cut. At the THHD, the goal of pruning as part of preservation maintenance is to perpetuate the non-stylistic historic character of the orchards and fruit trees. To the extent possible, the extant scaffold limbs should be preserved rather than be replaced with new major limbs.

When to Prune

Some types of pruning can be conducted at any time of year, while others should be only conducted in the dormant season. For the species of fruit tree present in the THHD orchards, the following guidelines apply:

- Anytime: root suckers; watersprouts; dead, damaged or diseased material
- Dormant season: structural cuts; rubbing and crossing branches; canopy thinning, reduction or raising cuts

Refer to the Preservation Maintenance Task Calendar (see Supplemental Information) for further guidance on when to prune fruit trees.

What to Prune

Pruning the THHD fruit trees requires many careful decisions about what to cut and why, as discussed previously in the Pruning to Stabilize section.

Dead, Diseased and Damaged Wood (the Three D's)
Several types of plant material should be universally and automatically removed: dead, diseased and damaged material. Dead, damaged and diseased branches can be carefully removed at any time of the year. Dead branches serve no purpose and may fall off and strike an object or people below. Damaged branches may still be alive and photosynthesizing, but when they are cracked, split or structurally unsound they cannot support a fruit crop and may break off and tear bark, causing further damage. Damaged branches can be pruned by making heading or thinning cuts beyond the damaged section or they may be removed entirely. Diseased branches should be cut well below the point of infection and disposed off-site or burned, to rid the orchard of disease inoculum. Pruning tools should be sterilized between diseased material cuts to avoid the spread of pathogens within and between trees.

Root Suckers

Suckers are vigorous tree growth that arises from roots below ground or below the graft union. Suckers draw energy and nutrients away from the tree canopy and should be removed as soon as they appear with pruners or loppers. Some species and rootstocks sucker more than others and require more frequent sucker removal.

Watersprouts

Watersprouts arise from scaffold branches and trunks above the graft union or above the ground on ungrafted fruit trees. Watersprouts can crowd a tree canopy and create crossing or rubbing branch situations. Remove by pruning or lopping back to the branch or trunk. Young watersprouts are often weakly attached and can be easily removed by simply bending them downward and snapping them off cleanly. Selected watersprouts can be trained to form new branches or limbs if the tree canopy is too thin. In this case, remove all but the desired watersprout and structurally prune the shoot until it becomes a new, stout branch.

Rubbing and Crossing Branches

Rubbing branches abrade each other and cause wounds that allow disease pathogens to enter the tree, or of left too long can fuse the branches together. Crossing branches may become rubbing branches in time and should be selectively removed by retaining the one with the better structure and orientation and removing the other. Target pruning should be used when branches are long or heavy.

Structural Pruning

Structural pruning is distinguishable from the types of pruning mentioned above in several ways. Whereas the three "D's", watersprouts, root suckers and rubbing branches are automatically removed any time of year, structural pruning entails a more thoughtful and conscientious approach to shaping, re-shaping or altering the form of a fruit tree over many years. Structural pruning requires a vision for the historic form and character of the tree and typically takes at least three years of gradual pruning to achieve a final result. Other reasons for structural pruning may include tree health, equipment access under the tree or worker access to the canopy.

Excessive Interior Growth (Canopy Cleaning)

Unmaintained fruit trees develop dense, crowded canopies with crossing, rubbing, dead, damaged and disease material. This was the case with many fruit trees at the THHD, until recent pruning work was performed. The preservation maintenance techniques described above should be used to gradually clean the canopies of older trees while retaining their characteristic scaffold form.

Tall or Wide-Spreading Branches (Canopy Reduction)

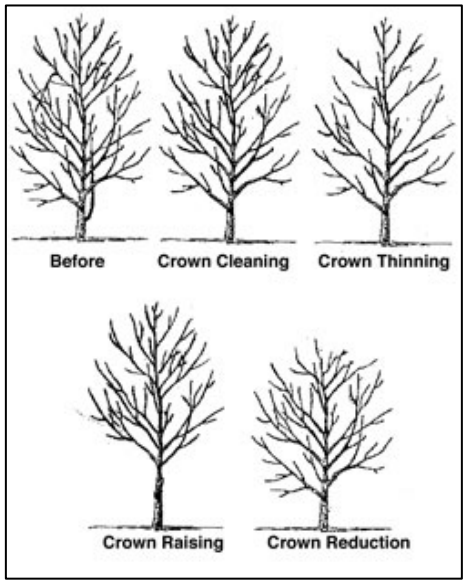


Figure 4.28: Summary of structural pruning techniques.

Older fruit trees that have reached their mature size produce only incremental new growth at the tips. This often causes branches in the upper canopy to slowly droop down and rest on underlying branches. Canopy reduction can be used to lighten the end weight of a branch to reduce the likelihood of breakage, to reduce mutual shading and encroachment between adjacent trees; or to make it easier to harvest fruit.

Low or Hanging Branches (Canopy Raising)
Raising the canopy of a fruit tree involves removal of the lower branches. This may be necessary to allow greater access to the trunk, to prevent fruit-laden branches from touching the ground, or to permit

equipment access between trees. Canopy raising for equipment access should be a consideration only when the risk of branch breakage by equipment strike outweighs the importance of retaining a healthy branch.

Training Replacement Limbs on Mature Trees

Individual limbs and branches on a mature tree occasionally die, break or need to be removed to improve the health and structure of the tree. When there is a vacancy in the tree canopy, it is possible to train a replacement branch into the space by selectively training a watersprout if one exists. The process takes many seasons to achieve but will eventually improve the tree by balancing the weight of the canopy and increasing photosynthetic capacity. This will also increase fruit yield.

Training New Trees

Replacement tree plantings or new fruit tree installations in the THHD orchards should be trained to reflect the characteristic form of the historic fruit trees, in order to render them compatible additions to the historic property. Consult the Orchard Stabilization Handbook (https://irma.nps.gov/DataStore/DownloadFile/459790) prepared by the NPS for the California State Park system for an overview of historic tree forms and styles.

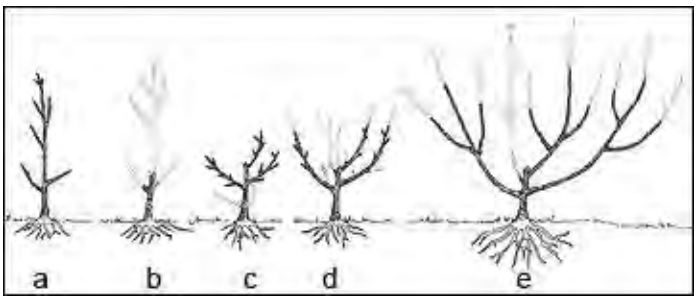


Figure 4.29: Pruning steps for young fruit trees (open bowl style, above).

Tool Sanitation and Maintenance

Keeping pruning tools clean, sharp, oiled and sterilized helps them perform effectively and with less effort from the worker, an important factor when many cuts are made on multiple fruit trees. Correct cuts with the right tools facilitate tree health by allowing trees to close wounds quickly and prevent entry by disease agents.

The following is a list of tools and materials to keep tools clean and sharp:

- Rubbing alcohol: to sterilize blades in between removal of diseased material
- Wire brush: for removing sap and build up on saw and pruner blades
- Scotch pad or steel wool: for sap and debris removal, and polishing blades
- Coarse and fine files: a round or flat file for sharpening pruner blades
- Lubrication (oil or grease): for the moving parts of tools and to prevent rust

Pruning Cuts

Heading Cuts

A 'heading cut' is targeted midway along a branch to shorten its length and stimulate new growth near the end of the cut. Heading cuts are used when the historic tree canopy has grown long and terminal branches hang down over each over. Heading shortens the terminal branches and brings the canopy closer to the trunk. Heading cuts give a stubby appearance to the branch if there is no side branch to cut back to, but the goal is to induce the branch to sprout new growth that can be formed into new side branches. To preserve the historic character of the trees, avoid making heading cuts to the major scaffold limbs.

Thinning Cuts

Thinning cuts reduce the overall length of a branch or stem by removing part of it back to a shorter lateral branch closer to the scaffold limb. This technique effectively transforms long branches into shorter stout branches. If performed correctly, the tree will not look overtly pruned. Pruning to a lateral branch of the appropriate size retains the appearance of an entire branch by allowing the lateral branch to become the new dominant leader of that branch. An appropriate-sized lateral branch is one that is no less than ½ the diameter of the removed part, or in other words the lateral must be large enough to avoid a conspicuous disparity between branch vs. lateral size. Thinning cuts are used to control tree height and spread. They are also used to control the direction of growth on certain branches by pruning to a lateral that is better.

Removal Cuts

A removal cut removes a branch or limb entirely, back to either a major scaffold limb or the trunk of the tree. Removal cuts are effective for lifting the canopy of a sagging tree through the removal of lower limbs, or for removing a crossing or rubbing branch. A few judicious branch removals can open up a crowded canopy. This is done carefully to avoid removing more than 25% of live material in one season. To prevent a loss of historic character in the THHD orchards, avoid removal of the major scaffold limbs unless they are dead or in severe decline, or if the goal is to re-train new scaffold limbs.

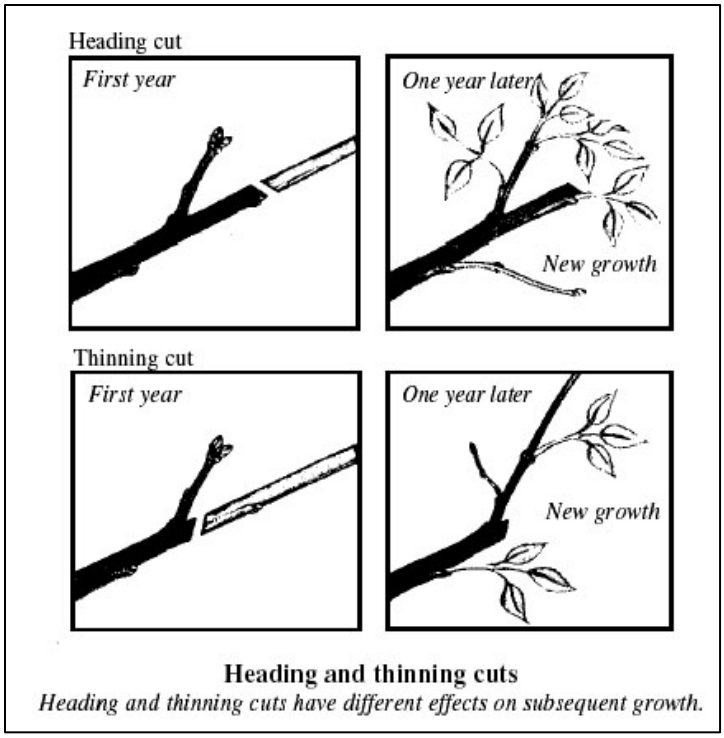


Figure 4.30: Demonstration of heading and thinning cuts.

Making good pruning cuts on medium-sized limbs requires an understanding of the bark-branch collar zone. The branch collar is a visible ridge or line where a branch joins with the trunk or a main scaffold limb. It is very important for tree health to not cut into this ridge of tissue. This is where wound closure will initiate once a branch is removed. Rapid wound closure is crucial for tree health since open or slowly-closing wounds are opportunities for invasion by pathogens and pests. An experienced pruner can identify the branch collar and its function to make a removal cut that does not damage the tree.

Target Pruning

Target pruning, also known as the 3-saw cut, is the method for safely removing large or heavy limbs from a tree without tearing bark below the branch. Target pruning must be used for all branch removals on fruit trees at Whiskeytown.

Target pruning involves first making an undercut on the branch to be removed, near but not at the target (Cut 1). Then a cut is made from the top of the branch (Cut 2). As the limb's fibers are cut and it begins to sag, the undercut closes and 'snaps' the branch off cleanly rather than tearing away bark underneath the branch. Cuts one and two can be repeated more than once on the same branch to remove it in small pieces. The final 'target' cut (Cut 3) is done just outside of the branch collar at an angle perpendicular to the removed branch – not parallel to the tree trunk. A target cut retains the branch collar for quick wound closure and also creates a smaller wound with less surface area than an improper 'flush cut.'

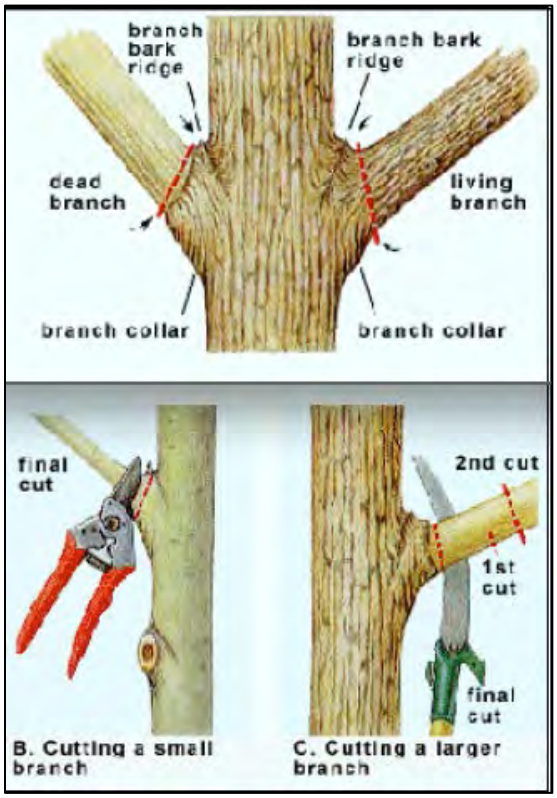


Figure 4.31: Target pruning illustrated.

Orchard Floor Maintenance

Brushing

Brushing is the manual or mechanical removal of shrubs, vines and small trees that encroach upon an orchard space. Areas of some orchards such as the slope to the west of the Back Field are inaccessible to wheeled equipment and vegetation management must be accomplished by hand. The following section describes effective tools and techniques for removing brush within the orchard areas of the THHD.

Pulaski

Many tools are capable of removing brush, but few excel at this task like a pulaski. The tool is a combined axe and adze head and was originally used for wild land firefighting. A pulaski is able to chop down stout brush material with the axe and then dig out the stump with the adze. A pulaski can be used carefully to leave soil relatively undisturbed, but it is also capable of digging and cutting quite deeply if necessary. As noted previously: it is imperative to avoid or minimize ground disturbance in known or potentially sensitive archaeologically areas in the orchards at THHD. Because the pulaski is capable of digging into soil it must be used carefully and safely to protect the user and any archaeological resources that may reside below grade.


Figures 4.32 and 4.33: Pulaski in action (left) and weed wrench tool (right).

Recommended use of the Pulaski at the THHD includes for the removal of Coyote brush, blackberry vine, seedling trees and small volunteer trees.

Weed Wrench

A weed wrench is a unique tool that grips small trees and shrubs by the base and uses a long levered handle to pull them up and out of the soil. This is a very useful and ergonomic tool when minimal soil disturbance is important.

Walk-Behind Field and Brush Mower

Walk-behind field and brush mowers are powerful and efficient, capable of cutting down medium-sized shrubs with ease. Walk-behind field and brush mowers can traverse moderate slopes, but are not designed for steep slopes. Placement of the single or double-blades allows the operator to cut brush in densely vegetated areas while maintaining a physical distance from the vegetation. The blades will also cut vegetation into fine pieces. Walk-behind brush and field mowers are best used for the first early season mowing when grass and brush are thick or for orchard stabilization when encroaching brush requires heavier equipment.


Figure 4.34: Brush mower.

Stump Herbicidal Treatment

Unwanted trees larger than 4”-6” can be difficult to remove by digging or pulling out. One option is to cut trees flush with the ground and apply herbicide with a brush to the freshly cut stump. This method does not disturb the soil or the roots of other trees. Use a systemic herbicide such as Glyphosate (Roundup) that will be translocated to the roots. Correct PPE and caution must be exercised when herbicides are used. Read the product label and material safety data sheet (MSDS) before use and apply the product according to its specification.

Herbicides are toxins that can injure the applicator or the environment and should be used sparingly. The above technique should be reserved for unwanted trees that are likely to re-sprout from the stump and cannot easily be removed by digging or pulling.

Mowing

Once brushing has removed the bulk of any encroaching vegetation, mowing becomes the ongoing operation that will maintain a healthy and competition-free orchard environment. Grass and vegetation management on the orchard floor is important for tree health, personal and vehicular mobility through the orchard, and worker health and safety.

Vegetation growing under or near fruit tree canopies competes for water and nutrients and can impose stress on the historic trees. Mowing reduces the biomass of grass and vegetation that consumes resources and transpires moisture out of the soil. Mowing the orchard floor also makes moving around within the orchard far easier and safer for workers: rough terrain is easier to see and avoid; ticks are less likely to attach to workers clothing; dew and moisture is kept underfoot and does not soak clothing.

Mowing vegetation adds organic matter to the soil and increases soil health as microbial action breaks down plant trimmings. Mowing and trimming can also be detrimental to trees if equipment is allowed to contact trunks or exposed roots. Mowers and weed eaters must be used with extreme caution around the fruit trees associated with the THHD. Methods for controlling orchard floor vegetation in the THHD orchards are described below:

Stringline trimmers (a.k.a."weedwhackers")

Stringline trimmers are commonly used to cut down grass and brush in orchards. They must be used with care and correct PPE must be worn: eye and ear protection, gloves, long pants and sturdy shoes.

Do not allow plastic stringline, blades or cutting head to come closer than three feet from a tree trunk to prevent nicking the bark, causing wounds or girdling the tree. Stringline trimmers have the advantage over mowers of being effective on steeper slopes and in rough terrain. However, stringline trimmers tend to leave tall grass conspicuously on the soil surface rather than finely chopping it up like a mower. The longer clippings are slower to break down and create a matted appearance. Stringline trimmers also tend to throw debris at high speed and can cause damage to fragile resources or injury to body parts. Avoid using weed eaters close to visitors or other unprotected workers, as well as around fragile items such as windows.

Riding Mower

Riding mowers are convenient and allow the operator to sit while operating the machine. These mowers are typically used for light-duty or secondary mowing operations, such as late spring or early summer mowing when grass growth is not so dense. The single or double-blades are typically located in the middle of the machine, making it difficult and unsafe to drive into thick overhanging brush areas.

They are not recommended for slopes due to the risk of tipping. Riding mowers are usually less powerful than walk- behind brush mowers and will bog down and die in thickly vegetated areas. Avoid soggy soil or swale areas to avoid getting the machine stuck.

Tractor with Flail Mower Implement

A flail mower is an implement that attaches to the rear power take off (PTO) of a tractor and is pulled behind to mow vegetation. This is the most effective orchard-mowing tool with sufficient power and width to mow 6' – 8' swaths. Unlike mowers with a single rotating blade, flail mowers have numerous small blades attached along the length of a rotating cylinder that 'flail' around at high speed. The cutting action is effective for moderate to thick vegetation.

Power and width are a flail mower's advantages and large areas can be cut quickly and effectively. The disadvantage of a flail mower is the overall size of the machine, which

limits its access to open orchard areas or widely spaced rows. In addition, while debris is chopped up reasonably well, a single-blade machine creates finer mulch.

Tractors should not be operated on slopes or when soils are wet. The weight of a tractor can cause severe soil compaction even if soils are merely moist. Due to their relatively large size and power, tractors can also do severe damage to fruit trees by catching and breaking limbs. Situational awareness is critical to avoid damaging trees or other resources. Only experienced tractor operators should mow within the THHD orchard areas.

Grazing

An alternative to mechanized equipment is controlled grazing by goats and/or sheep, which is an efficient and sustainable option for managing orchard floor vegetation. Grazing within the THHD has been used successfully on several occasions, particularly in the Back Field to control Himalayan Blackberry vines and reduce the height of annual grasses in the orchard floor and adjacent open areas.

To be effective grazing must be timed to coincide with the optimal stage of grass growth that is most palatable to the livestock. Goats for example may not eat as eagerly if the forage is too dry or "cured". Timing of grazing implementation will depend upon various factors such as weather and animal availability. Park managers may consider an integrated grazing approach that combines goats and sheep, since each species will focus on grazing different plant types. Any grazing activities must remain consistent with other recommended orchard management practices.

Irrigating

Lack of adequate soil moisture is a major health stressor in fruit trees, especially for young and old trees. Preserve orchard fruit trees by watering them if they show signs of drought stress. Some fruit tree species such as walnuts and pears are better able to tolerate dry conditions than others, but all fruit trees benefit from supplemental irrigation during the dry season. Different systems and approaches can be used to provide fruit trees with supplemental water at the THHD: a portable, truck-mounted water tank or collapsible bladder and a gas-powered water pump could effectively be used to irrigate the orchards at Whiskeytown. Another historically accurate way to water some of the

Figure 4.35: Soil berm for irrigation water retention.

orchards at the THHD such as the French Gulch Field is to rehabilitate and utilize the historic ditch and flume system to flood irrigate the orchards. This would not only provide a renewable and ready source of water, it provides interpretive potential to demonstrate how orchards were watered within the locale during the historic period.

Creating circular berms of soil around fruit trees at the drip line is an effective method of ensuring that water is delivered to tree roots efficiently and not wasted as runoff. Berms can be created by hand-digging trenches and piling up the loose soil or by bringing in compost, mulch or soil and applying it on top of the native soil.

Applying a layer of mulch around fruit trees will also utilize irrigation water efficiently and maximize water infiltration. Mulch prevents evaporation of soil moisture by shielding the soil from the sun and discouraging grass and vegetation growth.

Monitoring Soil Moisture: Soil Probe or Shovel

A standard round pointed shovel is an effective tool to test soil moisture in orchard areas in order to determine if irrigation is necessary. This test should be conducted in an area away from fruit tree roots and in an area approved by the park archaeologist or resource staff.

Digging is disruptive to the soil but allows a clear view of the depth of soil moisture.
A soil probe is a specialized tool for investigating soil moisture levels up to 18” deep, depending upon the penetrability of the soil. A soil probe is best used when and where soils are relatively moist. It is very difficult to use on dry, compacted or rocky soils.

Indications of Drought Stress

During periods of drought or below average rainfall monitor fruit tree leaves for the first visual signs of drought stress. Drought stress trees reduce solar exposure and evapotranspiration by curling their leaves or drooping them downwards. In long period of drought, a permanent wilting point is reached where leaf cells loose turgidity and cannot recover. As a result, particularly drought stressed trees will drop their leaves to prevent moisture loss through evapotranspiration.

Irrigation Frequency

Newly planted trees require regular water for at least the first three years until their roots are well established. A newly planted tree must be watered at least every other day during the dry season, and weekly the following year. Construct a soil basin at the drip line of the young tree to capture water and allow it to soak downwards to the roots.

As young tree roots develop and spread out in search of water, extend the diameter of the soil basin or remove it entirely and soak the area beyond the drip line of the tree. This will encourage roots to extend farther from the base of the tree. Irrigate deeply to encourage deep rooting and allow a period of drying out to force roots to grow deeper. These practices will

encourage strong root establishment that will make the tree more resilient during times of drought.

Most of the fruit trees in the Whiskeytown orchards appear to have adapted to their environmental conditions and are able to sustain themselves on seasonal rainfall and groundwater from the nearby riparian areas. Supplemental watering for mature trees may not be necessary except under extreme drought conditions. However, sometimes the difference between a fruit tree that survives and one that thrives is the application of just one or two deep irrigations during the dry season. Any additional water delivered during the summer, especially to older trees, may extend the life and vigor of these trees.

Watering Systems for Orchards

Individual tree watering systems

The availability, portability and flexibility of individual tree watering systems make them an attractive option for establishing young trees, especially in remote locations. The Treegator brand of drip watering bag is a popular and commonly used device designed to provide a trickle of water over a long period of time. One drawback is that they must be refilled on a regular basis.

Another option is the Groasis Waterboxx, which also supplies a trickle of water to young trees via a rope wick that is embedded into the soil at the root zone. The design of the Waterboxx is such that it supposedly condenses and captures atmospheric moisture at night and to replenish its reservoir, thus reducing or eliminating the need to refill the basin.

Figure 4.36: The Groasis Waterboxx, an irrigation device that is engineered to self-replenish.

Truck-Mounted Collapsible Water Bag

Supplying irrigation water to remote fruit trees can be a difficult challenge. The most flexible, portable and voluminous system is a truck-mounted water bag coupled with a pump and a long hose. This system is cost-effective, portable and easy to dismantle and store when not in use. The downside to this approach is the time and labor involved in the process as well as the limited capacity of a small tank relative to the number of trees that may need to be irrigated. Water weighs 8.3 pounds per gallon, so the maximum load capacity of the transporting vehicle must be considered before purchasing a water bag.


Figures 4.37 and 4.38: Truck-mounted collapsible water bag. Gas-powered pump produces about 35 psi.

A water bag system has been successfully used to irrigate fruit trees in remote orchards and would be suitable for the orchards at the THDD. Burch Manufacturing produces one model of water bag called Kolaps-a-Tank. The water bag is composed of vinyl with a fill hole at the top and a threaded outlet in the front. It holds up to 250 gallons of water. The weight of a full bag is 2,075 pounds, or just over one ton. A gas-powered portable water pump connected to the water bag by a suction hose can create up to 30 psi at the end of a 100’ garden hose, enough to quickly empty the water bag and supply fruit trees with supplemental irrigation. A truck capable of carrying one ton is required to safely transport the full bag.

A portable gas-powered water pump will pressurize the water adequately for spraying or hand watering trees. Be mindful of the engine exhaust port and aim it away from the vinyl bag or any other heat-sensitive materials. Secure the pump to the truck so it does not vibrate off of the tailgate of the truck.

A standard suction hose is required between the bag and the pump. A suction hose has a rigid wall structure that will not collapse under suction pressure. Using a series of reduction fittings, a regular ¾” garden hose can be attached to the pump and any type of nozzle or sprayer can be used to water the fruit trees. It is recommended that a hose shutoff valve be used after watering each tree to avoid wasting water. A full 250 gallon bag takes approximately 45 minutes to empty when hand watering. Monitor the amount of water in the tank and the number of trees needing water to ensure that all trees with irrigation needs receive water.

Historic Ditch Systems

Of all the historic ditch systems associated with the THHD that once served the orchards, only the Upper Crystal Creek Ditch (situated across Highway 299) has the potential to irrigate new orchards. Rehabilitation of the flume pipe systems that transported water from the Upper Crystal Creek Ditch to the French Gulch Field would provide a steady and generous supply of water to new fruit trees planted here.

The Lower Crystal Creek Ditch west of the Back Field is currently inoperable and would require extensive work to rehabilitate it to the point that it could supply water to the fruit trees in the Back Field. A small section of the ditch and hillside has washed out, effectively severing the continuity of this historic ditch. Significant earthwork and shoring up would be required to reestablish the ditch in this location.

Fertilizing

Tree health is intimately tied to the health and fertility of the soil, which is tied to a host of factors including soil parent material and geology, composition and texture, average annual rainfall, pH and past agricultural practices. Typically, fertilizing is best done when temperatures are warm and the soil is moist. This facilitates breakdown and release of nutrients into the soil to be made available to plant roots. Schedule fertilizer applications after mowing has occurred in the spring, but before the last rains. Actively growing tall grass may consume nutrients intended for the fruit trees, and rain is necessary to dissolve the fertilizer and naturally incorporate it into the soil where it is available to tree roots.

Common Deficiencies

The macronutrients that plants require in greater quantities are Nitrogen (N), Phosphorous (P) and Potassium (K). These nutrients are commonly listed on fertilizer bags as numbers in the order N-P-K, also called the “fertilizer analysis.” Deficiencies of any one of these three nutrients usually appear in the leaves first as chlorosis or discoloration. Micronutrient deficiencies can occur but is less likely due to the minute quantities utilized by plants compared to N, P and K.

Formulations (Simple vs. Complete / Synthetic vs. Organic)

Fertilizer addition is necessary to correct deficiencies and maintain fruit tree health, especially on soils with a long history of agricultural use, such as at the THHD. Organic fertilizers derived from plant and animal byproducts are highly recommended over synthetically manufactured fertilizers. Synthetic fertilizers are designed to be immediately available to plants in the form of readily soluble nutrients. However, this solubility contributes high levels of salts to the soil once the nutrient has been absorbed by the plant, or causes leaching below the root zone by rain or irrigation water. Organic fertilizers by contrast are not readily soluble to plants and must be acted upon by soil microorganisms. Microbes break down the more complex forms of organic nutrients into plant soluble form,

a process that does not contribute salt residue to the soil. Organic fertilizers also contribute moisture-retentive organic matter to the soil and improve soil health by promoting strong microbiological activity.

The fertilizer analysis indicates whether that fertilizer is simple (only one single nutrient) or complete (a range of nutrients). For example, analysis of the simple synthetic fertilizer Ammonium Nitrate shows that it supplies a single nutrient (Nitrogen) at the rate of 30-0-0. The product is 30% Nitrogen by volume, with no other nutrients present. This relatively high concentration of readily soluble nitrogen can actually damage sensitive plant roots if applied incorrectly. A complete organic source of Nitrogen is guano (bat excrement) with an analysis 10-3-1 (10% Nitrogen, 3% Phosphorous and 1% Potassium). The lower analysis of guano is less likely to burn or damage plant roots and contributes a wider range of macro and micronutrients to the soil.

Fertilizing Equipment

The application of fertilizer is made much more accurate and efficient with the right equipment. A quality scale with a large platform is essential for accurately measuring fertilizer, and five-gallon buckets make convenient containers for fertilizer at the scale and in the field. Be sure to tare the scale or calibrate it to discount the weight of the bucket itself when measuring fertilizer.

Two types of fertilizer spreaders are useful in an orchard setting: a hand spreader and a push spreader. A hand spreader allows more precise distribution of fertilizer but the hopper is limited to about seven pounds of fertilizer, requiring frequent refilling. Push spreaders hold up to 40 pounds and cover a much broader swath, but are less accurate. Carefully operate the equipment to avoid spilling fertilizer and possibly burning tree roots.

Figure 4.39: Common fertilizing equipment.

Compost

Compost is simply woody and vegetative plant material that has been broken down by microbial action within a pile or a windrow. Compost is a cultivated version of the same material naturally created by biotic ecosystems under tree canopies. Trees cycle nutrients from the soil and create leaves and twigs that eventually fall back to the soil and are broken down by microbes, ready for uptake again by the tree. Compost amends the soil by providing organic matter and improving soil structure, water retention, fertility and microbial action. Compost is highly beneficial to soils and trees when applied regularly

Compost production on an orchard scale requires some effort and space, as well as enough biomass from trimmings and clippings. An on-site composting operation may not be feasible at Whiskeytown due to budget and personnel constraints. However compost should still be regularly applied to the THHD fruit trees to improve soil health. Compost is typically incorporated into the soil by forking, digging or rototilling, but it can also be left on the soil surface as a top dressing or nutritional mulch.

Any type of compost may be used in the orchards as long as it is certified weed-free and distributed evenly around the drip line of the tree but NOT against the trunk of the tree. Compost should be kept at least 3-inches away from the trunk. A layer 1” - 2” is adequate as a top dressing. Avoid adding a very thick a layer of compost that could smother roots. Normally it is recommended that compost be incorporated into the soil by tilling or digging it, but in archaeologically sensitive areas compost can be applied as a top dressing.

Mulching

“Mulch” is a term that captures a broad range of organic and synthetic products and is highly recommended in the Whiskeytown orchards. The essence of mulch is that it covers the soil, suppresses weed growth and retains soil moisture, but it must be kept away from direct contact with tree trunks, or at least 3-inches away. Mulching around the trunks of fruit trees to a depth of 4” greatly reduces annual grass growth and the subsequent need to risk injuring the tree with grass-trimming equipment.

Covering soil with mulch reduces the evaporation of ambient soil moisture by the sun and cools the root zone. Wood chip mulch has minor nutritive value for trees but does contribute organic matter to the soil as it breaks down. Mulched trees have a net increase in growth over non- mulched trees.

Just about any kind of mulch may be used around fruit trees as long as it does not contain invasive weed seeds or unwanted plant parts. Avoid using mulch of uncertain origin or from tree care companies that cannot guarantee the mulch they deliver is clean. The most common form of mulch for orchards is wood chips created by a wood chipper, but any kind of organic material may be used as mulch around fruit trees. Coarse wood chips produced by commercial wood chippers are usually readily available from tree care companies and

often for free, but as mentioned above do not accept free mulch without verifying its composition.

Integrated Pest Management

A healthy orchard ecosystem supports a vast range of insects, fungi and bacteria that are mostly not detrimental to fruit trees, and it is highly recommended that the park develop a comprehensive Integrated Pest Management (IPM) plan to further the goals of healthy and vibrant landscapes.

The goal of an IPM plan is to establish an environmentally sound balance between pest and beneficial organisms where pest damage below an established threshold is acceptable. Some orchard pests adversely affect fruit trees only during certain growth stages, or when their populations are high. Other pests such as codling moth only affect fruit quality without harming the tree itself. For the historic fruit trees at Whiskeytown, fruit damage alone may be below an action threshold, since tree health is not affected. For historic preservation, the primary resource is the fruit trees, rather than the fruit.

Pest identification and population monitoring is critical to developing an IPM plan and determining whether action is necessary. To identify insect use tools such as sticky cards and pheromone traps to capture insect pests and a loupe or hand lens to view them more closely. The University of California's integrated pest management website http://www.ipm.ucdavis.edu/ is a good online resource for pest identification and control recommendations specific to California.

IPM recommends an approach that integrates cultural practices, biological control agents, and chemicals agents. Chemical pesticides are seen as a useful tool but a last resort. The following control practices and can be utilized at Whiskeytown NRA, but chemicals may only be utilized if approved by the park IPM coordinator:

Cultural Controls

- Raking up fallen fruit in the fall to prevent overwintering of pests;
- Pruning out diseased material and burning or disposing of the material off-site;
- Applying Tanglefoot to tree trunks to prevent crawling insects from reaching the canopy;
- Using insecticidal soaps and horticultural oils to suffocate scale and soft-bodied insects;
- Trapping of vertebrate pests such as gophers.

Biological Controls

- Use of Bacillus thuringiensis (BT) to combat larval pests;
- Use of lacewing, lady beetle and other natural enemies of harmful insects;
- Use of beneficial nematodes to attack soil pests such as weevils or harmful nematodes.

Chemical Controls

- Use of systemic fungicides that are translocated through the infecting fungus;
- Use of selective insecticides that poison specific insects and stages of the lifecycle;
- Use of systemic herbicides that are translocated through the invading plant.

Spraying

If it is necessary to spray trees or vegetation in the THHD orchards, ensure that safety precautions are taken and that the work is performed under the guidance of a qualified applicator. Rinse sprayers thoroughly to remove all residues before refilling with new product. It is not recommended to spray tree insecticide in canopies with a sprayer that is also used for herbicides. Residues may be present that can injure the tree.

Choose the right time of day and conditions to spray. Do not spray when wind is above ten miles per hour to avoid drift and avoid spraying in the heat of day when plants are actively transpiring. Move around the entire tree for good coverage but do not overspray to the point of runoff. Use the appropriate nozzle and pressure to avoid misting and off-target drift. Rinse sprayers thoroughly after use and allow to air dry.

The types of products that might be sprayed at THHD (if approved) include:

- Biological control agents
- Horticultural oils
- Insecticidal soaps
- Compost tea
- Selective herbicides
- Selective pesticides

PPE for any spraying operation should include:

- Eye protection
- Filtering face piece (dust mask) or respirator
- Gloves (chemical resistant latex, nitrile, PVC or neoprene)
- Long sleeves
- Long pants
- Rubber boots
- Tyvek suit

Hand-held pump sprayers are convenient for small batches of spray and also easy to clean. They hold up to three gallons of mix and are portable but may not be suitable for carrying long distances.
Backpack pump sprayers accommodate up to four gallons of mix and are very portable. They are worn on the back and can weigh up to 35 pounds when full. They have a limited vertical range and are not suitable for spraying tree canopies taller than ten feet. Backpack

sprayers should not be used from ladders as the weight of the backpack may cause loss of balance.

Spraying large volumes in an orchard requires a larger tank sprayer operated by a small engine. This apparatus can be pulled through the orchard by hand or by ATV, or mounted on the bed of a trunk. A tank sprayer can propel larger volumes of product much higher into tree canopies than a hand operated pump sprayer, and is suitable for spraying tall trees.

Fruit Management

Fruit Thinning for Tree Health

Thinning a percentage of young fruit from a tree early in the season benefits the tree and the quality of the fruit that is allowed to ripen. Some trees bear such heavy crops that branches break under the weight of maturing fruit, damaging the tree in the process. Removing about 50% of the young fruit when they are marble-sized will lighten the load on branches and allow trees to direct energy into developing the remaining fruit, resulting in larger and better quality fruit. A good rule of thumb is to space fruit about 6” apart.

After thinning, the remaining apples may also exhibit fewer moth larvae holes. Fruit pests such as the Codling moth prefer to lay their eggs where fruits are closely touching or pressed together. Thinning fruit greatly reduces the number of preferred laying sites for the moth.


Figure 4.40: Thin fruit clusters to create 4” – 6” between fruit.

Propping Fruit-laden Branches

A technique for preventing heavily laden fruit tree branches from snapping is to prop them with 2” x 4” until harvest time. It is a good idea to cut a notch in one end of the 2” x 4” to cradle the branch and prevent it from falling down. When there are not enough props for the number of laden branches, prioritize propping scaffold limbs first. A small outer limb that breaks will be more easily replaced and do less damage to the tree than an entire scaffold limb that breaks or splits near the trunk.

Fruit Harvest

Each year Whiskeytown NRA holds a much-loved Harvest Festival at the Camden House. Care should be taken during this public harvest event to ensure that historic apple and pear trees are not damaged by overzealous harvesting. Monitor the use of long-handled fruit picking tools so the branches are not pulled to the breaking point. For safety reasons, orchard ladder use is not recommended for the general public. Reserve ladder use for staff members and those who are familiar with proper orchard ladder use.

The Whiskeytown NRA Superintendent's Compendium permits the public to harvest fruit for personal consumption up to 2 gallons of fruit per-person, per-day. This practice is both socially beneficial and useful for orchard maintenance, as gleaning removes the fruit as an attractant for bears and other wildlife.

Ripeness Indicators

It is important to teach visitors how to determine when fruit is ripe and right for picking in order to protect the historic trees during harvesting. Trees can be damaged by pulling too hard and breaking spurs or branches.

Pears are ripe when the flesh near the stem yields slightly when pressed. The surest test of ripeness in pears is to grasp the fruit and bend it upwards slowly. If it snaps off at the stem easily then it is nearing ripeness.

Apples are judged for ripeness visually by subtle lightening of the flesh and the appearance of small lenticels against the background flesh color. Ripe apples also release from the branch more easily than unripe apples. When fruits of any species begin to fall to the ground it is a sure sign that the ripening period has begun.

Harvesting Equipment

Specialized fruit harvesting bags expedite the process of gathering large quantities of fruit. They are also safer when working from a ladder as both hands are free. Orchard bags are carried over one shoulder and have an open bottom that is rolled up securely during harvesting and unrolled when offloading fruit into a sorting bin. The bottom design eliminates the need to repeatedly lift a heavy bag of fruit.


Figures 4.41 and 4.42: Specialized equipment like harvesting bags (left) vs. cardboard boxes (right).

Tree Identification Tags

Labeling orchard trees provides several benefits to park staff and visitors, and is highly recommended. At a minimum, tree labels provide readily accessible information on the type of tree, the fruit cultivar and the identification number assigned to each tree. Many labelling options exist for trees, but historic orchard fruit tree labels should be chosen based on cost, legibility and long-term durability.

Engraved plastic or metal labels are the most durable, but also the most costly. Aluminum-clad paper labels are easy to write on and relatively indelible, but the labels themselves are thin and tend to wear out and disappear over time and the thin wire that comes with them is insufficient for attaching to most limbs. Plastic labels are simple and cost-effective, but lack durability and permanence.

The type of label used and how it is attached will differ depending on the size and age of the tree: labels for young trees will need to be attached by wire to a sturdy limb or to the protective tree cage. Larger trees can have the labels attached in a secure fashion directly to their trunks. The preferred method for affixing the label to the tree trunk is by a small nail, with a spring to nestle the label gently against the trunk (Figure 4.43). Nailing into the tree trunk is slightly invasive however the potential impacts to the tree are outweighed by the benefits of durability, permanence and ease of locating the label. It is recommended to nail the label at a predicable trunk height and on a consistent side of each tree making it visible and easy to read.

To avoid installing nails into the fruit tree trunks labels can be fixed to metal or wooden stakes and placed in the ground near the tree trunk. This may work better in a garden setting than in an orchard; however, and does add additional material costs and may also be an obstacle for orchard vegetation maintenance. Tying tree labels to a low-hanging branch with wire is another non-invasive option, although it may prove difficult to locate small labels hidden amongst the foliage and increases the risk of the label falling or being pulled off.

A novel and increasingly useful approach that might be worth considering is the use of interactive labels that include "QR" codes engraved on the label. When scanned with a smart phone that has a QR app installed, additional information about the tree can be pulled up online, such as its history, age, botanical notes, etc.

Figure 4.43: Engraved label on tree with nail and spring (vanderbilt.edu/trees/history).

Figure 4.44: Engraved label with QR code affixed to a stake in the ground (info.plantsmap.com/tags).

Propagation Planning

Repopulating a historic orchard with period-appropriate trees can be done one of two ways: purchasing trees or propagating trees. Purchasing trees is acceptable when the goal is to represent cultivars once existed in the orchard but are no longer extant. For this purpose heirloom fruit cultivars are commercially available from a number of reputable nurseries (see Appendix for a list of sources). Propagation by grafting is the preferred method for replanting a historic orchard because this process retains the precise genetics of the historic orchard, however it does require considerable time and skill on the part of park staff if done in house. Another option is to contract with nearby orchard experts or greenhouse facilities for the grafting and growing of historic fruit trees from the THHD orchards. The horticulture department at Shasta College is one such facility capable and willing to work with the park to achieve the propagation needs described in this management plan.

Propagating new fruit trees by taking scion cuttings from existing historic trees and grafting the scions onto appropriate rootstocks is an ancient technique and one that produces fruit trees that are genetically identical to the parent tree, thus conserving the exact genetics of the historic orchard cultivars. The process of grafting involves manually splicing together two separate pieces of a tree: the scion (fruiting part) and the rootstock (below ground part).

Propagation planning involves planning ahead by purchasing appropriate rootstock in bulk from a reputable supplier (see Appendix for a list of sources) up to one year ahead of time and also collecting, labelling and storing scion cuttings during the winter dormant season for use the following spring. Scion cuttings should be taken from the newest growth on the tree, sometimes referred to as “last year’s wood” so it is vigorous and likely to graft successfully. Collect ample scion cuttings and label them accurately. Place the cuttings in an air-tight sealable bag along with a moistened paper towel (damp, but not dripping). Store the bag(s) of scion cuttings in the refrigerator until ready to use.

When purchasing rootstock be careful to select a type that will produce a tree of appropriate size and character: in most historic California orchards including all those within the THHD this means a “standard” rootstock that will produce a full-sized, standard tree and not one that is dwarfed. Many contemporary rootstocks are bred to produce dwarfed fruit trees but such trees would never achieve the full-sized stature and character of trees from the historic period of the Tower and Camden eras.

Grafting fruit trees is a science and an art and takes practice, patience and skill to do well. The specialized tools of the trade include a grafting knife, sealant tape or wax, rubber band ties and plastic or aluminum plant labels. An alternative to using a grafting knife is a specialized grafting tool called the Omega which is much safer than using a blade and highly recommended for novice grafters. The limitation of the grafting tool is it only accepts scion and rootstock up to a particular size and cannot perform other types of grafting that a knife can do.

After successfully grafting scion rootstock together the challenge is to keep the fragile grafted tree hydrated so that when the graft takes (i.e. cell growth connects the cambium of each piece together) the scion buds can leaf out and begin to grow into a new tree. Labelling of each individual tree is important so that the correct trees are eventually planted in the correct orchard locations. Aluminum-clad paper labels work well for small trees and wire is sufficient to attach the label. Do not twist the labels on to the tree too tightly or it may girdle the enlarging tree trunk. One trick is to wrap the wire around a pen several times to form a spring, which will uncoil as the tree grows in girth. Monitor the young trees each season to ensure that they do not grow over the wire and capture it within the enlarging trunk and limbs and eventually replace the aluminum label with a more permanent label.

Figure 4.45: Omega grafting tool, 2016 (PWR Cultural Landscapes Program).

Genetic Identification Information and Recommendations

Genetic testing of potentially historic fruit trees is a useful tool for determining whether the trees are indeed recognized as cultivated varieties of fruit or perhaps just chance seedlings. The genetic testing process involves collection and preparation of fruit tree leaf samples to identify any known "markers" in their DNA, which can then be compared against a database of known fruit cultivars with known genetic markers unique to that species or cultivar.

In 2011 and 2016, Whiskeytown National Recreation Area initiated genetic testing on several fruit and nut trees associated with the THHD. The results of these efforts are noted in the tables below. Ultimately, the genetic test results for several samples were inconclusive due to incomplete DNA mapping of apple varieties. In the future, visual and/or taste tests may be appropriate in instances where the historic trees are bearing fully-formed (i.e., characteristic) fruit. The following subject matter experts may be able to offer the park assistance identifying fruit through visual and/or taste tests.

- Ram Fishman, Greenmantle Nursery
- C. Todd Kennedy, Western Horticultural Society
- Lori Brakken, Western Cascade Fruit Society

Additionally, a prioritized list of fruit trees identified for future genetic testing is available in this section of the document to help guide future preservation maintenance activities in the historic district.

2011 Genetic Test Results

In 2011, twenty-four leaf samples (all apples) were sent to the USDA National Center for Genetic Resource Preservation in Fort Collins, Colorado to be tested and compared against a database of known cultivars. The results of this effort yielded five confirmed apple cultivar matches and nineteen unconfirmed or unknown apple cultivars, as described below:

Species	Tree ID	Cultivar	Confirmed	Notes
Apple	TH-Ap-001	Reinette Franche	YES	Confirmed DNA match
Apple	CY-Ap-016	White Winter Pearmain	YES	Confirmed DNA match
Apple	CY-Ap-013	Jonathan or related cultivar	YES	Confirmed DNA match
Apple	CY-Ap-011	Collamer Twenty Ounce	YES	Confirmed DNA match
Apple	CY-Ap-008	Dermen Winesap	YES	Confirmed DNA match
Apple	BF-Ap-001 BF-Ap-002	unknown	No USDA match, identical to each other	Identify fruit through visual and/or taste tests
Apple	BF-Ap-013	unknown	No USDA match	Identify fruit through visual and/or taste tests
Apple	BF-Ap-015	unknown	No USDA match	Identify fruit through visual and/or taste tests
Apple	BF-Ap-020	unknown	No USDA match	
Apple	CY-Ap-003	unknown: likely seedling	No USDA match	
Apple	CY-Ap-009	unknown	No USDA match	
Apple	CY-Ap-012	unknown	No USDA match	Identify fruit through visual and/or taste tests
Apple	CY-Ap-014 CY-Ap-015	unknown	No USDA match, identical to each other	Identify fruit through visual and/or taste tests
Apple	CY-Ap-017 CY-Ap-018	unknown	No USDA match, identical to each other	Identify fruit through visual and/or taste tests
Apple	CY-Ap-020	unknown	No USDA match	Identify fruit through visual and/or taste tests
Apple	FG-Ap-007	unknown	No USDA match	
Apple	FG-Ap-008	unknown	No USDA match	
Apple	FG-Ap-009	unknown	No USDA match	
Apple	FG-Ap-010	unknown	No USDA match	Identify fruit through visual and/or taste tests
Apple	FG-Ap-011	unknown	No USDA match	Identify fruit through visual and/or taste tests
Apple	FG-Ap-012	unknown	No USDA match	Identify fruit through visual and/or taste tests
Apple	TH-Ap-002	unknown	No USDA match	Identify fruit through visual and/or taste tests
Apple	TH-Ap-008	unknown	No USDA match	
Apple	TH-Ap-010	unknown	No USDA match	

Table 4.2: List of apple samples sent to the USDA National Center for Genetic Resource Preservation in Fort Collins, Colorado in 2011 by Whiskeytown NRA.

2016 Genetic Test Results

On April 19, 2016, leaf samples from twenty-one different fruit trees associated with the THHD were sent to the Foundation Plant Services laboratory at U.C. Davis for genetic testing. See table below for a list of samples submitted for testing with updated 2016 genetic test results in the notes column. A copy of the final report is available in the supplemental information section of the document.

Species	Tree ID	Results of GeneticTesting	Notes
Apple	BF-Ap-003	No USDA match Identical to BF-Ap-006 and BF-Ap-007	Confirmed on 6/16
Apple	BF-Ap-004	No USDA match	Confirmed on 6/16
Apple	BF-Ap-006	No USDA match Identical to BF-Ap-003 and BF-Ap-007	Confirmed on 6/16
Apple	BF-Ap-007	No USDA match Identical to BF-Ap-003 and BF-Ap-006	Confirmed on 6/16
Apple	BF-Ap-008	Matched 'Colby Baldwin'	Confirmed on 6/16
Apple	BF-Ap-009	No USDA match	Confirmed on 6/16
Apple	BF-Ap-010	Matched 'Winesap'	Confirmed on 6/16
Apple	BF-Ap-011	No USDA match	Confirmed on 6/16
Apple	BF-Ap-012	No USDA match	Confirmed on 6/16
Apple	BF-Ap-014	No USDA match	Confirmed on 6/16
Apple	BF-Ap-017	No USDA match	Confirmed on 6/16
Apple	BF-Ap-019	No USDA match	Confirmed on 6/16
Apple	CY-Ap-019	Matched 'Lady'	Confirmed on 6/16
Apple	Th-Ap-009	No USDA match	Confirmed on 6/16
Apple	TH-Ap-011	No USDA match	Confirmed on 6/16
Apple	TH-Ap-012	No USDA match	Confirmed on 6/16
Apple	TH-Ap-013	No USDA match	Confirmed on 6/16
Grape	FG-Gr-001	No USDA match Test revealed Vitis californica, native grape	Confirmed on 6/16
Grape	TH-Gr-001	No USDA match Test revealed Vitis californica, native grape	Confirmed on 6/16
Walnut	CY-Wa-001	No USDA match Testing revealed Juglans hindsii., Northern California black walnut,	Confirmed on 6/16
Walnut	FG-Wa-001	No USDA match Testing revealed Juglans hindsii., Northern California black walnut	Confirmed on 6/16

Table 4.3: List of tree and vine samples sent to the Foundation Plant Services laboratory at U.C. Davis for genetic identification in 2016 by Whiskeytown NRA.

Future Genetic Testing Priority List

In 2016, twenty-one fruit tree and vine leaf samples were sent to Plant Foundation Services at UC Davis to be tested. The sample set included seventeen apples, two grapes and two walnuts. The selected apple samples had been previously identified as named varieties by fruit experts through visual analysis, but not confirmed or denied by genetic testing. The grape and walnut samples were selected for genetic testing to help us better understand if they represent extant remnants of historically grown cultivars so that future management decisions can be made to retain or remove them.

The goal of genetic testing of fruit and nut trees at THHD is to verify previous efforts to visually identify these varieties, or to reclassify these fruits as "unknown" if no match is found. Previous efforts to identify the fruit consisted of both genetic testing of samples in 2011 and also visual identification by fruit experts, which may or may not be accurate. If confirmed, these and previously confirmed trees will serve as the source for scion cuttings for future propagation efforts. Conserving the germplasm of these trees through propagation and replanting perpetuates the historic character and genetic authenticity of the orchards at the THHD.

Funding at the time the samples were sent to UC Davis was sufficient to cover only twelve samples. In the future, additional funds may be allocated to cover the cost of the remaining samples that have already been provided by the park. It should be noted that Foundation Plant Services will retain the untested samples so they are prepared to move forward as soon as more funding is available.

In addition to the fruit tree samples already sent to labs for testing, there are still more fruit trees that could be tested if funding allows. Testing as many of the extant fruit trees as possible will further add to the park's understanding of what fruit and nut cultivars were grown historically at the THHD so that accurate management decisions may be made with respect to orchard treatment. The recommendation for future sample collection and testing includes any of the following trees:

Species	Tree ID	Cultivar
Apple	BF-Ap-016	Unknown
Apple	BF-Ap-021	Unknown
Apple	BF-Ap-022	Unknown
Apple	BF-Ap-023	Unknown
Apple	BF-Ap-024	Unknown
Apple	BF-Ap-025	Unknown
Apple	CY-Ap-001	Unknown
Apple	CY-Ap-002	Unknown
Apple	CY-Ap-010	Unknown
Apple	CY-Ap-037	Unknown, propagated from old tree #23 (now dead)
Apple	FG-Ap-001	Unknown
Apple	FG-Ap-002	Unknown
Apple	FG-Ap-003	Unknown
Apple	FG-Ap-013	Unknown
Apple	TH-Ap-003	Unknown
Apple	TH-Ap-005	Unknown
Apple	TH-Ap-006	Unknown
Apple	TH-Ap-007	Unknown
Apple	TH-Ap-014	Unknown
Apple	TH-Ap-015	Unknown
Apple	TH-Ap-016	Unknown
Apple	TH-Ap-017	Unknown
Apple	TH-Ap-018	Unknown
Apple	TH-Ap-019	Unknown
Apple	TH-Ap-020	Unknown
Apple	TH-Ap-021	Unknown
Apple	TH-Ap-022	Unknown
Apple	TH-Ap-023	Unknown
Apple	TH-Ap-024	Unknown

Species	Tree ID	Cultivar
Cherry	BF-Ch-001	Unknown
Cherry	FG-Ch-003	Unknown
Cherry	TH-Ch-008	Unknown
Cherry	TH-Ch-011	Unknown
Cherry	TH-Ch-012	Unknown
Cherry	TH-Ch-013	Unknown
Cherry	TH-Ch-014	Unknown
Cherry	TH-Ch-015	Unknown
Crabapple	TH-Ca-001	Unknown
Grape	CY-Gr-001	Unknown, possibly native grape
Pear	BF-Pr-004	Unknown
Pear	CY-Pr-001	Unknown
Pear	CY-Pr-002	Unknown
Pear	CY-Pr-003	Unknown, possibly 'Bartlett'
Pear	TH-Pr-001	Unknown
Pear	TH-Pr-002	Unknown
Quince	FG-Qu-001	Unknown

Tables 4.4 and 4.5: Prioritized list of apple trees (left) and other species of fruit and nut trees (right) within the THHD that require genetic identification in the future.

Section Five: Orchard and Historic Fruit Tree Treatment

The Cultural Landscape Interim Treatment Report for the Tower House Historic District identified preservation as the primary treatment for the THHD. Rehabilitation was identified as a secondary treatment, which would be applied in discrete areas to fulfill specific management objectives. Of the four treatment standards, preservation standards require retention of the greatest amount of historic fabric, including the landscape's historic form, features, and details as they have evolved over time. Rehabilitation is the only one of the standards that makes possible compatible alterations or additions for contemporary needs. Specifically, rehabilitation recommends some changes to the cultural landscape to allow for contemporary uses while retaining the landscape's historic character.

Recommended treatment actions identified in the THHD Interim Orchard Management Plan are consistent with *The Secretary of the Interior's Standards for the Treatment of Historic Properties (1996)* and *Director's Order 28: Cultural Resource Management Guideline* as outlined below.

The Secretary of the Interior's Standards for the Treatment of Historic Properties

Preservation is defined at the act or process of applying measures necessary to sustain the existing form, integrity, and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. New exterior additions are not within the scope of this treatment; however, the limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a preservation project.

Rehabilitation is defined as the act or process of making possible a compatible use for a property through repair, alterations, and additions while preserving those portions or features which convey its historical, cultural, or architectural values.

Restoration is defined as the act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time by means of removal of features from other periods in history and reconstruction of missing features from the restoration period. The limited and sensitive upgrading of mechanical, electrical, and plumbing systems and other code-required work to make properties functional is appropriate within a restoration project.

Reconstruction is defined as the act or process of depicting, by means of new work, the form, features, and detailing of a non-surviving property, or any part thereof, for the purpose of replicating its appearance at a specific time and in its historic location.

Summary of Alternatives for Rehabilitation of Representative Orchards

Alternative #1

Alternative #1 represents the most feasible option for the rehabilitation of representative orchard areas within the THHD. Stabilization and preservation of all extant fruit and nut trees is the primary objective; however, new plantings are recommended. The number of new trees to propagate, plant and maintain are relatively low in number. This alternative will offer some opportunities for enhanced interpretation through the inclusion of new special events and/or activities at the site or expansion of the existing Harvest Festival.

Alternative #2

Alternative #2 represents an intermediate or "happy medium" option for the rehabilitation of representative orchard areas within the THHD. Stabilization and preservation of select fruit and nuts trees is the primary objective; however, new plantings are recommended. The number of new trees to propagate, plant and maintain is still relatively low; though, several additional fruit trees have been recommended in addition to Alternative #1 within the Back Field, French Gulch Field and Tenant House locations. This alternative also incorporates the park's desire to reestablish historic irrigation features in association with the rehabilitation of a representative orchard in the French Gulch Field, while providing opportunities for enhanced interpretation through interpretive panels, downloadable phone applications (app) and/or brochures.

Alternative #3

Alternative #3 represents the most ambitious option for rehabilitation of representative orchard areas within the THHD. Stabilization and preservation of historic fruit trees is the primary objective with recommendations for removal of non-historic fruit and nut trees. The number of fruit trees to propagate, plant and maintain is significantly higher in this alternative and represents a large investment in staff, funding and maintenance. Additionally, this alternative incorporates the park's desire to reestablish historic irrigation features in association with the rehabilitation of a representative orchard in the French Gulch Field. Notably, this alternative will provide several new opportunities for visitor interpretation and engagement with the fruit trees and orchards at the THHD, including interpretive panels, downloadable phone applications (app) and/or brochures. Temporary perimeter fencing was also recommended in this alternative to protect proposed fruit trees from wildlife damage.

Primary Rehabilitation Objectives and Historic Character by Orchard Area[56]

Camden House Yard (CY)*

- *Primary Preservation Objective:* Prioritize stabilization and preservation of historic fruit trees over non-historic fruit trees.

- *Historic Character:* During the Camden era (1869-1912), Charles Camden developed a comfortable home and yard for the enjoyment of his family and friends. The front path to the Camden House was lined with deep plant beds containing flowering shrubs and herbaceous plants. A fenced vegetable garden was located in the upper, far west end of the yard. The lower, east area of the yard was a grassy meadow with ornamental shade trees, fruit trees and a croquet lawn. A lily pond was situated between the Camden House and Willow Creek. All of these features were perpetuated by Camden's daughter in the Tenant era (1913-1933), with the exception of several new structures, including the carriage house and wood shed.

  During the Camden's occupation of the site, the Tower House Hotel grounds were a two-acre parcel under separate ownership from Charles Camden. The grounds contained the orchards that had initially been planted by Levi Tower, a stage company with a stable and stable yard, a barn, hog pen, granary, store room and a pump house. The area was transformed in the Tenant era (1913-1933) when the stage company ceased operations (1915), the Tower House Hotel burned to the ground (1919), and the highway that would become Highway 299 was constructed through the property (1924), leveling most improvements associated with the hotel operation.

*Alternatives maps were not developed for the Camden House Yard since preservation, rather than rehabilitation, is the primary treatment objective for this location.

[56] Information describing the historic character of the Camden House Yard, Back Field, French Gulch Field and Tenant House was adapted from the Tower House Historic District Cultural Landscape Interim Treatment Report, 2008.

Figure 5.1: Photograph showing the Camden House Yard looking northwest toward remnant fruit trees, 2016. Note irrigation feature in foreground (PWR Cultural Landscapes Program).

Figure 5.2: Photograph looking north toward Highway 299 of a remnant fruit tree associated with the Tower Grounds, 2016 (PWR Cultural Landscapes Program).

Back Field

- *Primary Rehabilitation Objective:* Maintain historic fruit tree spacing and establish a representative orchard composed of largely apple and pear trees utilizing historic traditions and associated spacing on a 30 x 30-foot grid. During this period, apple and pear trees were commonly planted on a 30 x 30-foot grid; cherry trees on a 25 x 25-foot grid; and peach trees in a 15x20-rectangular configuration.

- *Historic Character:* During the Camden era (1869-1912), the Back Field was enclosed by fences and contained fruit orchards, which included approximately 210 apple trees and 60 pear trees. The orchard floor was maintained with low herbaceous vegetation. A horse pasture was situated at the east end of the field in the area that later received the Tenant House barn.

Figure 5.3: Photograph of the Back Field with a remnant fruit tree in the foreground looking southeast toward the Tower Gravesite, 2016 (PWR Cultural Landscapes Program).

French Gulch Field (FG)

- *Primary Rehabilitation Objective:* Establish a representative orchard composed of largely peach trees utilizing a historic 15 x 20-foot grid and rehabilitation of a historic irrigation system to enhance interpretation of the site. During this period, apple and pear trees were commonly planted on a 30 x 30-foot grid; cherry trees on a 25 x 25-foot grid; and peach trees in a 15x20-rectangular configuration.

- *Historic Character:* During the Camden era (1869-1912), the French Gulch Field was enclosed by fences and contained approximately 53 apple trees and 100 peach trees. The orchard floor was composed of low, herbaceous vegetation and was flood-irrigated by a ditch near the Yreka Road trace.

Figure 5.4: Photograph looking northeast of the French Gulch Field, 2016. Note stone wall remnant in foreground (PWR Cultural Landscapes Program).

Tenant House (TH)

- *Primary Rehabilitation Objective:* Establish a representative interpretive orchard demonstrating the diversity of fruit and nut trees planted within a late nineteenth century or early twentieth century home or garden orchard in California.

- *Historic Character:* During the Camden era (1869-1912), the site that would receive the Tenant House was occupied by a house for millworkers, which was located near the sawmill. During the Tenant era (1913-1933), Charles Camden's daughter and her husband built the Tenant House for a future ranch manager. The Tenant House was informally planted with ornamental plants and fruit trees and the yard was enclosed by a wood frame and chicken wire fence. A vegetable garden was located on a terrace on the east side of Mill Creek.

Figure 5.5: Photograph looking southeast showing the Tenant House Orchard and its associated yard, 2016 (PWR Cultural Landscapes Program).

Alternatives

The following site plans were prepared in consultation with park staff and reflect three different alternatives for the rehabilitation of representative orchards within the Back Field, French Gulch Field and Tenant House locations. The representational site plans include recommendations for the general configuration of new orchard spaces based on historic fruit tree spacing standards, which were commonly implemented during the period. This is reflected through the proposed siting of apple and pear trees in the Back Field on a 30 x 30-foot grid; the proposed siting of cherry trees in the Tenant House on a 25 x 25-foot grid; and the proposed siting of peach trees in the French Gulch sited in a 15x20-rectangular configuration. Each site plan represents potential strategies for the rehabilitation and associated introduction of new fruit trees to support park resource management and interpretive objectives and not do not specifically show, for example, specific fruit trees or encroaching woody vegetation to be removed.

Park managers may consider rehabilitation of representative orchards within the THHD as a phased approach. Acquisition of funding, interaction with other proposed park projects such as development and installation of a potable water source at the Camden House and Tenant House, rehabilitation of historic irrigation ditch systems, and operational issues such as staffing, equipment, and materials will likely influence execution of this plan. Full implementation of actions associated with the selected alternative could be many years into the future and some may never be implemented.

Actions Common to All Orchard Areas

Several recommendations are common to all orchard areas and include the following actions, which can be applied to all alternatives:

- Protection of archeological resources through testing, mitigation and avoidance.
- Stabilization and preservation of orchard land uses and historic orchard spaces.
- Protection of historic orchards and fruit trees from health stressors and deterioration.
- Introduction of cover crops to reestablish historic character of orchard locations.
- Installation of permanent tags to all existing and new fruit trees in all orchard locations.

Summary of Actions by Alternative

The following table provides a summary of actions by alternative. Please refer to alternatives recommendations below for additional detail regarding specific actions.

Orchard Area	Alternative #1	Alternative #2	Alternative #3
Camden House Yard (CY)	Allow all fruit trees associated with the "nursery" to decline without intervention. Propagate all historic fruit and nut trees in orchard area and replant in an appropriate representative orchard location. Create new opportunities for enhanced interpretation through festivals.	Stabilize and preserve all historic fruit and nut trees in Camden House Yard. Propagate any historic germplasm from new "nursery" trees, especially where the original source tree has died. Immediately remove all trees associated with the fruit tree staging area or "nursery" by flush cutting. Allow all remaining non-historic fruit trees in the Camden House Yard to decline without intervention and allow stumps to deteriorate naturally. Reestablish representative cherry trees in Camden House Yard in known locations based on historic photographs and supporting documentation.	Stabilize and preserve existing historic fruit and nut trees in Camden House Yard. Propagate any historic germplasm from new "nursery" trees, especially where the original source tree has died. Remove native exotic woody vegetation around the perimeter of the Camden House Yard to establish low, herbaceous ground cover throughout the area. Immediately remove all trees associated with the fruit tree staging area or "nursery" by flush cutting. Immediately remove all non-historic fruit trees from the Camden House Yard and allow stumps to deteriorate naturally. Consider large-scale rehabilitation of Camden House Yard complemented by period appropriate ornamental plants and fruit trees with completion of CLR, Part II.

Back Field (BF)	Stabilize and preserve all existing fruit trees in the Back Field. Propagate all historic fruit trees in the Back Field. Remove incompatible vegetation. Retain remnant grid associated with historic apple and pear trees and utilize in representative orchard rehabilitation. Plant twenty-five to thirty replacement trees following general guidelines prescribed in the Alternative #1 map in an effort to reestablish a small representative orchard onsite. Irrigate proposed fruit trees using minimally invasive methods outlined in the stabilization and preservation maintenance section of the document. Create new opportunities for enhanced interpretation through festivals.	Stabilize and preserve all historic fruit trees in the Back Field. Allow non-historic fruit trees in Back Field to decline without intervention. Consider treatment or removal of diseased trees. Remove encroaching vegetation around the perimeter of the Back Field to reveal the full former extent of the orchard area. Propagate all historic fruit trees in the Back Field. Selectively thin persimmon and actively manage footprint of the grove. Retain remnant grid associated with historic apple trees and utilize in representative orchard rehabilitation. Plant forty replacement trees following general guidelines prescribed in the Alternative #2 map in an effort to reestablish a small representative orchard onsite. Irrigate the Back Field by utilizing the park proposed Camden House potable water system or consider options outlined in the preservation maintenance section of the document. Enhance interpretive opportunities by developing a self-guided interpretive orchard brochure, phone	Stabilize and preserve all historic fruit and trees in the Back Field. Remove non-historic fruit trees in an effort to prepare the site for large-scale planting in the future. Remove native and exotic woody vegetation around the perimeter as well as within the Back Field to establish low, herbaceous ground cover. Propagate all historic fruit trees in Back Field. Retain remnant grid associated with historic apple trees and utilize in representative orchard rehabilitation. Plant up to 125 replacement trees following general guidelines prescribed in the Alternative #3 map in an effort to reestablish a large representative orchard onsite. Irrigate the Back Field by utilizing the park proposed Camden House potable water system or consider options outlined in the preservation maintenance section of the document. Establish a new temporary fence (mill lumber/peeled pole and wire) that is compatible with the historic character of the THHD around the Back Field to protect trees from wildlife damage.

		app, or install an interpretive panel adjacent to reestablished representative orchard near the Tower Gravesite.	Enhance interpretive opportunities by developing a self-guided interpretive orchard brochure, phone app, or install interpretive panels adjacent to reestablished representative orchard.
French Gulch Field (FG)	Stabilize and preserve all existing fruit and nut trees in the French Gulch Field. Propagate all historic fruit trees in French Gulch Field. Plant twenty to twenty-five replacement trees following general guidelines prescribed in the Alternative #1 map in an effort to reestablish a small representative orchard onsite. Irrigate proposed fruit trees using minimally invasive methods outlined in the stabilization and preservation maintenance section of the document. Create new opportunities for enhanced interpretation through festivals.	Stabilize and preserve all historic fruit and nut trees in the French Gulch Field. Allow non-historic fruit and nut trees in French Gulch Field to decline without intervention. Consider treatment or removal of diseased trees. Remove incompatible encroaching vegetation around the perimeter of the French Gulch Field, especially along the fence line. Retain specimen oak tree adjacent to Trinity Mountain Road. Propagate all historic fruit trees in the French Gulch Field, including the quince. Plant twenty-five to thirty replacement trees following general guidelines prescribed in the Alternative #2 map in an effort to reestablish a small representative orchard onsite. Irrigate proposed fruit trees using a rehabilitated irrigation ditch near the Yreka Road trace and flume system associated with stone masonry spillway #1. Park may also consider alternate flood irrigation strategies without	Stabilize and preserve all historic fruit and trees in the French Gulch Field. Remove native and exotic woody vegetation around the perimeter as well as within the upper field terrace to establish a low, herbaceous ground cover. Retain specimen oak tree along fence line. Remove non-historic fruit and nut trees in an effort to prepare the site for new planting in the future. Preserve and maintain the quince grove adjacent to the fence line. Propagate all historic fruit trees in French Gulch Field, including the quince. Plant approximately 100 replacement trees following general guidelines prescribed in the Alternative #3 map in an effort to reestablish a large representative orchard onsite. Preserve and maintain remaining portions of fence line and establish a new temporary fence (mill lumber/peeled pole and wire) that is compatible with the historic character of the THHD around the remainder of the French Gulch Field to

		rehabilitation of the ditch near the Yreka Road trace to protect archeological features. Enhance interpretive opportunities by developing a self-guided interpretive orchard brochure, phone app, or install an interpretive panel adjacent to reestablished representative orchard near the remnant stone wall.	protect trees from wildlife damage. Irrigate proposed fruit trees using the rehabilitated Upper Crystal Creek Ditch and flume systems associated with stone masonry spillway #1 and stone masonry spillway #2 as well as the ditch near the Yreka Road trace. Park may also consider alternate flood irrigation strategies without rehabilitation of the ditch near the Yreka Road trace to protect archeological features Enhance interpretive opportunities by developing a self-guided interpretive orchard brochure, phone app, or install interpretive panels adjacent to reestablished representative orchard.
Tenant House (TH)	Stabilize and preserve all existing fruit trees in the Tenant House including fruit trees associated with the "Mill Garden." Propagate all historic fruit trees in the Tenant House. Plant approximately ten replacement trees following general guidelines prescribed in the Alternative #1 map in an effort to reestablish a small representative orchard onsite with an emphasis on interpretation. Irrigate proposed fruit trees using minimally invasive methods	Stabilize and preserve all historic fruit and trees in the Tenant House. Allow non-historic fruit trees in Tenant House to decline without intervention. Consider treatment or removal of diseased trees. Propagate all historic fruit trees in the Tenant House. Plant ten to fifteen replacement trees following general guidelines prescribed in the Alternative #2 map in an effort to reestablish a small representative orchard onsite with an emphasis on interpretation.	Stabilize and preserve all historic fruit and trees in the Tenant House. Allow all fruit trees associated within the "Mill Garden" to decline without intervention due to low interpretive potential and problems associated with access to the trees. Propagate all historic fruit trees in the Tenant House. Plant up to forty replacement trees following general guidelines prescribed in the Alternative #3 map in an effort to reestablish two small representative orchards onsite with an emphasis on interpretation. Irrigate the Tenant House

	outlined in the stabilization and preservation maintenance section of the document. Create new opportunities for enhanced interpretation through activities and/or festivals.	Irrigate proposed fruit trees using minimally invasive methods outlined in the stabilization and preservation maintenance section of the document. Enhance interpretive opportunities by developing a self-guided interpretive orchard brochure, phone app, or install an interpretive panel adjacent to reestablished representative orchard near the Tenant House.	locations by utilizing the park proposed Tenant House potable water system or consider options outlined in the preservation maintenance section of the document. Establish a new fence around both Tenant House representative orchard locations to protect trees from wildlife damage. Enhance interpretive opportunities by developing a self-guided interpretive orchard brochure, phone app, or install an interpretive panel adjacent to the reestablished representative orchard near the Tenant House and proposed representative orchard at the northwestern extent of the orchard area.

Table 5.1: Summary of actions by alternative for the Camden House Yard, Back Field, French Gulch Field and the Tenant House.

Alternative #1

Camden House Yard

Recommendations:

- Allow all fruit trees associated within the fruit tree staging area or "nursery" located in the Camden House Yard to decline without intervention. Flush cut dead trees to minimize ground disturbance and remove debris from the site.
- Propagate all historic fruit and nut trees in Camden House Yard and replant in an appropriate representative orchard location (e.g. Back Field, French Gulch Field, and Tenant House).
- Create new opportunities for enhanced interpretation through special events such as a spring bloom activities onsite or expansion of the existing Harvest Festival.

Back Field

Recommendations:

- Stabilize and preserve all existing fruit trees in the Back Field.
- Propagate all historic fruit trees in the Back Field.
- Remove incompatible vegetation (non-historic vegetation, including native and exotic woody vegetation) through selective thinning to open up the orchard area to the Tower Gravesite to increase light.
- Retain remnant grid associated with historic apple and pear trees and utilize in representative orchard rehabilitation.
- Plant twenty-five to thirty replacement trees following general guidelines prescribed in the Alternative #1 map in an effort to reestablish a small representative orchard onsite.
    - Maintain historic composition of fruit tree species characteristic of existing orchard by planting known cultivars of apple and pear trees. When possible, selected cultivars should include varieties that were previously identified as present at the site through confirmed genetic identification. Period appropriate local cultivars as well as cultivars noted in the 1859 "Tower House Garden Book" may also be selected for replanting. See Appendix as well as the historic context section of the document for additional information.
    - Tree spacing should be representative of historic orchard grid configurations for apple and pear trees. Most commonly, apple and pear tree spacing was on a 30 x 30-foot grid, which resulted in forty trees per acre.
    - Install temporary cages around individual proposed fruit trees to offer protection against browsing wildlife.
    - Irrigate proposed fruit trees using minimally invasive methods outlined in the stabilization and preservation maintenance section of the document.
- Create new opportunities for enhanced interpretation through special events such as a spring bloom activities onsite or expansion of the existing Harvest Festival.

French Gulch Field

Recommendations:

- Stabilize and preserve all existing fruit and nut trees in the French Gulch Field.
- Propagate all historic fruit trees in the French Gulch Field.
- Plant twenty to twenty-five replacement trees following general guidelines prescribed in the Alternative #1 map in an effort to reestablish a small representative orchard onsite.
    - Maintain historic composition of fruit tree species characteristic of orchard by planting known cultivars of peach trees. When possible, selected cultivars should include varieties that were previously identified as present at the site through confirmed genetic identification; however, this is not possible at the THHD since there are no peach trees extant. Period appropriate cultivars noted in the Appendix may be selected for replanting.
    - Rehabilitation activities will incorporate the "octopus tree" into the orchard by utilizing it as the southwest "anchor" for the proposed apple and peach trees. All proposed trees should be planted on the upper terrace adjacent to Trinity Mountain Road. No new planting should be undertaken west of the rock wall remnants due to wildlife and highway right-of-way concerns. Also, no new planting should occur on the lower terrace as a result of archeological resources.
    - Tree spacing should be representative of historic orchard grid configurations for peach and apple trees. Most commonly, peach tree spacing was on a 15 x 20-foot rectangular alignment, which resulted in a higher density of trees per acre than apples and pears at 30 x 30-foot spacing.
    - Install temporary cages around individual proposed fruit trees to offer protection against browsing wildlife.
    - Irrigate proposed fruit trees using minimally invasive methods outlined in the stabilization and preservation maintenance section of the document.
- Create new opportunities for enhanced interpretation through special events such as a spring bloom activities onsite or expansion of the existing Harvest Festival.

Tenant House

Recommendations:

- Stabilize and preserve all existing fruit trees in the Tenant House including fruit trees associated with the "Mill Garden."
- Propagate all historic fruit trees in the Tenant House.
- Plant approximately ten replacement trees following general guidelines prescribed in the Alternative #1 map in an effort to reestablish a small representative orchard onsite.
    - Rehabilitation activities should focus on establishing an interpretive orchard with a diverse assemblage of fruit and nut trees representative of a period home or garden orchard. When possible, selected cultivars should include varieties that were previously identified as present at the site through confirmed genetic identification. Period appropriate local cultivars as well as cultivars noted in the 1859 "Tower House Garden Book" may also be selected for replanting. See Appendix as well as the historic context section of the document for additional information.

  - Proposed trees should be planted on the northeast side of the Tenant House and south of Mill Road. Minimal planting should occur in front of the Tenant House until Part II of the CLR can provide a more comprehensive planting plan.
  - Proposed trees may include apple, pear, crabapple, quince, grape, hazelnut and cherry and do not need to be planted in a grid.
  - Install temporary cages around individual proposed fruit trees to offer protection against browsing wildlife.
  - Irrigate proposed fruit trees using minimally invasive methods outlined in the stabilization and preservation maintenance section of the document.
- Create new opportunities for enhanced interpretation through special events such as a spring bloom activities onsite or expansion of the existing Harvest Festival.

Interim Orchard Management Plan

Tower House Historic District - Back Field (BF) | Alternative #1

Pacific West Regional Office | Cultural Landscapes Program | 2016

Willow Creek

Lower Crystal Creek Ditch and Camden Water Ditch Trail

Levi Tower Grave Trail

Highway 299

French Gulch Field (FG)

Camden House Yard (CY)

Nursery

Camden House

Legend

- Back Field Boundary
- Adjacent Orchard Boundary
- Trail
- Creek
- Apple (AP)
- Cherry (CH)
- Pear (PR)
- Persimmon Grove (PS)

Map 5.1

Map Key #	Tree ID #	Status	Map Key #	Tree ID #	Status
00	BF-AP-001	H	18	BF-CH-003	U
01	BF-AP-002	H	19	BF-AP-009	H
02	BF-AP-025	NH	20	BF-AP-010	H
03	BF-AP-004	H	21	BF-AP-011	H
04	BF-AP-003	H	22	BF-CH-004	U
05	BF-AP-006	H	23	BF-CH-005	D
06	BF-AP-007	H	24	BF-PR-003	U
07	BF-AP-008	H	25	BF-PR-004	H
08	BF-CH-001	H	26	BF-AP-018	H
09	BF-PR-002	U	27	BF-AP-017	H
10	BF-PR-001	NH	28	BF-PS-001	U
11	BF-AP-024	NH	29	BF-AP-016	H
12	BF-AP-023	NH	30	BF-PR-005	NH
13	BF-AP-022	U	31	BF-AP-015	H
14	BF-AP-021	U	32	BF-AP-014	H
15	BF-AP-020	U	33	BF-AP-013	H
16	BF-AP-019	U	34	BF-AP-012	U
17	BF-CH-002	NH	35	BF-CH-006	D

Status: H = historic, NH = non-historic, U = unknown, D = dead

0 50 100 200 feet

Interim Orchard Management Plan
Tower House Historic District - French Gulch Field (FG) | Alternative #1

Pacific West Regional Office | Cultural Landscapes Program | 2016

Upper Crystal Creek Ditch

Stone Masonry Spillway #2

Stone Masonry Spillway #1

Redwood Water Tank

Trinity Mountain Road

Highway 299

Camden House Yard (CY)

Stone Wall

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Map 5.2

Legend

- Historic District Boundary
- French Gulch Field Boundary
- Adjacent Orchard Boundary
- Ditch
- Structure
- Apple (AP)
- Cherry (CH)
- Grape (GR)
- Pear (PR)
- Quince Grove (QU)
- Walnut (WA)

0 100 200 feet

Map ID #	Tree ID #	Status
00	FG-AP-013	NH
01	FG-GR-001	U
02	FG-AP-002	U
03	FG-CH-001	D
04	FG-AP-001	NH
05	FG-AP-003	U
06	FG-WA-001	U
07	FG-WA-012	U
08	FG-WA-008	NH
09	FG-QU-001	U
10	FG-PR-001	U
11	FG-AP-006	D
12	FG-CH-002	U
13	FG-WA-011	NH
14	FG-WA-002	U
15	FG-WA-003	U
16	FG-WA-005	U
17	FG-WA-004	U
18	FG-WA-006	U
19	FG-WA-007	U
20	FG-AP-007	U
21	FG-AP-008	U
22	FG-AP-009	U
23	FG-AP-010	H
24	FG-AP-011	H
25	FG-AP-012	H
26	FG-CH-003	H

Status: H = historic, NH = non-historic, U = unknown, D = dead

Interim Orchard Management Plan
Tower House Historic District - Tenant House (TH) | Alternative #1

Pacific West Regional Office | Cultural Landscapes Program | 2016

Back Field (BF)

Camden House Yard (CY)

Levi Tower Grave Trail

Willow Creek

Mill Garden

Mill Creek

Lower Crystal Creek Ditch and Camden Water Ditch Trail

Legend

Map 5.3

- Historic District Boundary
- Tenant House Boundary
- Adjacent Orchard Boundary
- Trail
- Creek
- Apple (AP)
- Crabapple (CA)
- Cherry (CH)
- Pear (PR)
- Cherry Plum (CP)

Status: H = historic, NH = non-historic, U = unknown, D = dead

0 100 200 feet

Map ID #	Tree ID #	Status
00	TH-CH-001	U
01	TH-CH-009	U
02	TH-CH-010	U
03	TH-CH-011	U
04	TH-CH-012	U
05	TH-CH-013	U
06	TH-AP-002	H
07	TH-AP-001	H
08	TH-AP-003	H
09	TH-AP-004	U
10	TH-AP-005	U
11	TH-PR-002	U
12	TH-AP-007	NH
13	TH-CH-003	U
14	TH-CH-005	U
15	TH-AP-008	NH
16	TH-AP-006	U
17	TH-AP-019	U
18	TH-CH-004	U
19	TH-AP-009	NH
20	TH-AP-010	NH
21	TH-PR-001	U
22	TH-CA-001	U
23	TH-GR-001	U
24	TH-AP-011	H
25	TH-AP-013	U
26	TH-AP-012	U
27	TH-AP-024	H
28	TH-CP-001	U
29	TH-AP-014	U
30	TH-AP-015	U
31	TH-AP-016	U
32	TH-AP-017	U
33	TH-CH-015	U
34	TH-CH-014	U
35	TH-CH-016	U
36	TH-AP-022	U
37	TH-AP-021	U
38	TH-AP-020	U
39	TH-AP-023	U
40	TH-CH-008	U
41	TH-AP-018	U

Alternative #2

Camden House Yard

Recommendations:

- Stabilize and preserve all historic fruit and nut trees in the Camden House Yard.
    - If status of tree is unknown continue to stabilize and preserve the tree until a determination of age can be made through tree coring or through some other means such as trunk diameter or tree rings. It should be noted that historic fruit trees often have trunk cavities that render them updateable using coring techniques alone.
- Propagate any historic germplasm from new "nursery" trees, especially where the original source tree has died.
- Immediately remove all trees associated with the fruit tree staging area or "nursery" by flush cutting and remove debris from site. Also remove cages and irrigation system (pipes, sprinkler heads) associated with the fruit tree staging area or "nursery".
- Allow remaining non-historic fruit trees in the Camden House Yard to decline without intervention and allow stumps to deteriorate naturally. Consider treatment or removal of diseased trees.
- Reestablish representative cherry trees in Camden House Yard in known locations based on historic photographs and supporting documentation.

Back Field

Recommendations:

- Stabilize and preserve all historic fruit trees in the Back Field.
    - If status of the tree is unknown continue to stabilize and preserve the tree until a determination of age can be made through tree coring or through some other means such as trunk diameter or tree rings. It should be noted that historic fruit trees often have trunk cavities that render them updateable using coring techniques alone.
- Allow non-historic fruit trees in the Back Field to decline without intervention. Consider treatment or removal of diseased trees.
- Remove encroaching vegetation around the perimeter of the Back Field to reveal the full former extent of the orchard area.
- Propagate all historic fruit trees in the Back Field.
- Selectively thin persimmon and actively manage footprint of the grove.
- Retain remnant grid associated with historic apple trees and utilize in representative orchard rehabilitation.
- Plant forty replacement trees following general guidelines prescribed in the Alternative #2 map in an effort to reestablish a small representative orchard onsite.
    - Maintain historic composition of fruit tree species characteristic of orchard by planting known cultivars of apple and pear trees. When possible, selected cultivars should include varieties that were previously identified as present at the site through confirmed genetic identification. Period appropriate local cultivars as well as cultivars noted in the 1859 "Tower House Garden Book"

may also be selected for replanting. See Appendix as well as the historic context section of the document for additional information.
    - Tree spacing should be representative of historic orchard grid configurations for apple and pear trees. Most commonly, apple and pear tree spacing was on a 30 x 30-foot grid, which resulted in forty trees per acre.
    - Install temporary cages around individual proposed fruit trees to offer protection against browsing wildlife.
    - Irrigate the Back Field by utilizing the park proposed Camden House potable water system (PMIS 154455) or consider options outlined in the preservation maintenance section of the document.
- Enhance interpretive opportunities through the dissemination of orchard information. Examples of potential interpretive opportunities include development of a downloadable phone app or a self-guided interpretive orchard brochure. Installation of an interpretive panel adjacent to the reestablished representative orchard near the Tower Gravesite with information regarding historic irrigation systems may also provide enhanced interpretation of the site.
    - Interpretation of the orchard spaces should be sited in a location that will not detract from the cultural landscape or hinder maintenance objectives for the orchard.
    - In the future, consider updating the recently completed Long Range Interpretive Plan to include the THHD orchards.

French Gulch Field

Recommendations:

- Stabilize and preserve all historic fruit and nut trees in the French Gulch Field.
    - If status of tree is unknown continue to stabilize and preserve the tree until a determination of age can be made through tree coring or through some other means such as trunk diameter or tree rings. It should be noted that historic fruit trees often have trunk cavities that render them updateable using coring techniques alone.
- Allow non-historic fruit and nut trees in the French Gulch Field to decline without intervention. Consider treatment or removal of diseased trees.
- Remove incompatible encroaching vegetation around the perimeter of the French Gulch Field, especially along the fence line. Retain specimen oak tree adjacent to Trinity Mountain Road.
- Propagate all historic fruit trees in the French Gulch Field, including the quince.
- Plant twenty-five to thirty replacement trees following general guidelines prescribed in the Alternative #2 map in an effort to reestablish a small representative orchard onsite.
    - Maintain historic composition of fruit tree species characteristic of orchard by planting known cultivars of peach trees. When possible, selected cultivars should include varieties that were previously identified as present at the site through confirmed genetic identification; however, this is not possible since

there are no peach trees extant in the THHD. Period appropriate cultivars noted in the appendix may be selected for replanting.
    - Tree spacing should be representative of historic orchard grid configurations for peach trees. Most commonly, peach tree spacing was on a 15 x 20-foot rectangular alignment, which resulted in a higher density of trees per acre than apples and pears.
    - Install temporary cages around individual proposed fruit trees to offer protection against browsing wildlife.
    - Irrigate proposed fruit trees using a rehabilitated irrigation ditch near the Yreka Road trace and flume system associated with stone masonry spillway #1. Park may also consider alternate flood irrigation strategies without rehabilitation of the ditch near the Yreka Road trace to protect archeological features.
- Enhance interpretive opportunities through the dissemination of orchard information. Examples of potential interpretive opportunities include development of a downloadable phone app or a self-guided interpretive orchard brochure. Installation of an interpretive panel adjacent to the reestablished representative orchard near the near the remnant stone wall may also provide enhanced interpretive opportunities.
    - Interpretation of the orchard spaces should be sited in a location that will not detract from the cultural landscape or hinder maintenance objectives for the orchard.
    - In the future, consider updating the recently completed Long Range Interpretive Plan to include the THHD orchards.

Tenant House

Recommendations:

- Stabilize and preserve all historic fruit and trees in the Tenant House.
    - If status of tree is unknown continue to stabilize and preserve the tree until a determination of age can be made through tree coring or through some other means such as trunk diameter or tree rings. It should be noted that historic fruit trees often have trunk cavities that render them updateable using coring techniques alone.
- Allow non-historic fruit trees in the Tenant House to decline without intervention. Consider treatment or removal of diseased trees.
- Propagate all historic fruit trees in the Tenant House.
- Plant ten to fifteen replacement trees following general guidelines prescribed in the Alternative #2 map in an effort to reestablish a small representative orchard onsite.
    - Rehabilitation activities should focus on establishing an interpretive orchard with a diverse assemblage of fruit and nut trees representative of a period home or garden orchard. When possible, selected cultivars should include varieties that were previously identified as present at the site through confirmed genetic identification. Period appropriate cultivars as well as cultivars noted in the 1859 “Tower House Garden Book” may also be selected for replanting. See Appendix as well as the historic context section of the document for additional information.

  - Proposed fruit trees should be planted on the northeast side of the Tenant House and south of Mill Road. Minimal planting should occur in front of the Tenant House until Part II of the CLR can provide a more comprehensive planting plan.
  - Proposed trees may include apple, pear, crabapple, quince, grape, hazelnut and cherry and do not need to be planted in a grid.
  - Install temporary cages around individual proposed fruit trees to offer protection against browsing wildlife.
  - Irrigate proposed fruit trees using minimally invasive methods outlined in the stabilization and preservation maintenance section of the document.
- Enhance interpretive opportunities through the dissemination of orchard information. Examples of potential interpretive opportunities include development of a downloadable phone app or a self-guided interpretive orchard brochure. Installation of an interpretive panel adjacent to the reestablished representative orchard near the Tenant House may also provide enhanced interpretive opportunities.
  - Interpretation of the orchard spaces should be sited in a location that will not detract from the cultural landscape or hinder maintenance objectives for the orchard.
  - In the future, consider updating the recently completed Long Range Interpretive Plan to include the THHD orchards.

Interim Orchard Management Plan

Tower House Historic District - Back Field (BF) | Alternative #2

Pacific West Regional Office | Cultural Landscapes Program | 2016

Map 5.4

Legend

- Back Field Boundary
- Adjacent Orchard Boundary
- Trail
- Creek
- Apple (AP)
- Cherry (CH)
- Pear (PR)
- Persimmon Grove (PS)

Map Key #	Tree ID #	Status	Map Key #	Tree ID #	Status
00	BF-AP-001	H	18	BF-CH-003	U
01	BF-AP-002	H	19	BF-AP-009	H
02	BF-AP-025	NH	20	BF-AP-010	H
03	BF-AP-004	H	21	BF-AP-011	H
04	BF-AP-003	H	22	BF-CH-004	U
05	BF-AP-006	H	23	BF-CH-005	D
06	BF-AP-007	H	24	BF-PR-003	U
07	BF-AP-008	H	25	BF-PR-004	H
08	BF-CH-001	H	26	BF-AP-018	H
09	BF-PR-002	U	27	BF-AP-017	H
10	BF-PR-001	NH	28	BF-PS-001	U
11	BF-AP-024	NH	29	BF-AP-016	H
12	BF-AP-023	NH	30	BF-PR-005	NH
13	BF-AP-022	U	31	BF-AP-015	H
14	BF-AP-021	U	32	BF-AP-014	H
15	BF-AP-020	U	33	BF-AP-013	H
16	BF-AP-019	U	34	BF-AP-012	U
17	BF-CH-002	NH	35	BF-CH-006	D

Status: H = historic, NH = non-historic, U = unknown, D = dead

0 100 200 feet

Willow Creek

Lower Crystal Creek Ditch and Camden Water Ditch Trail

Levi Tower Grave Trail

Highway 299

French Gulch Field (FG)

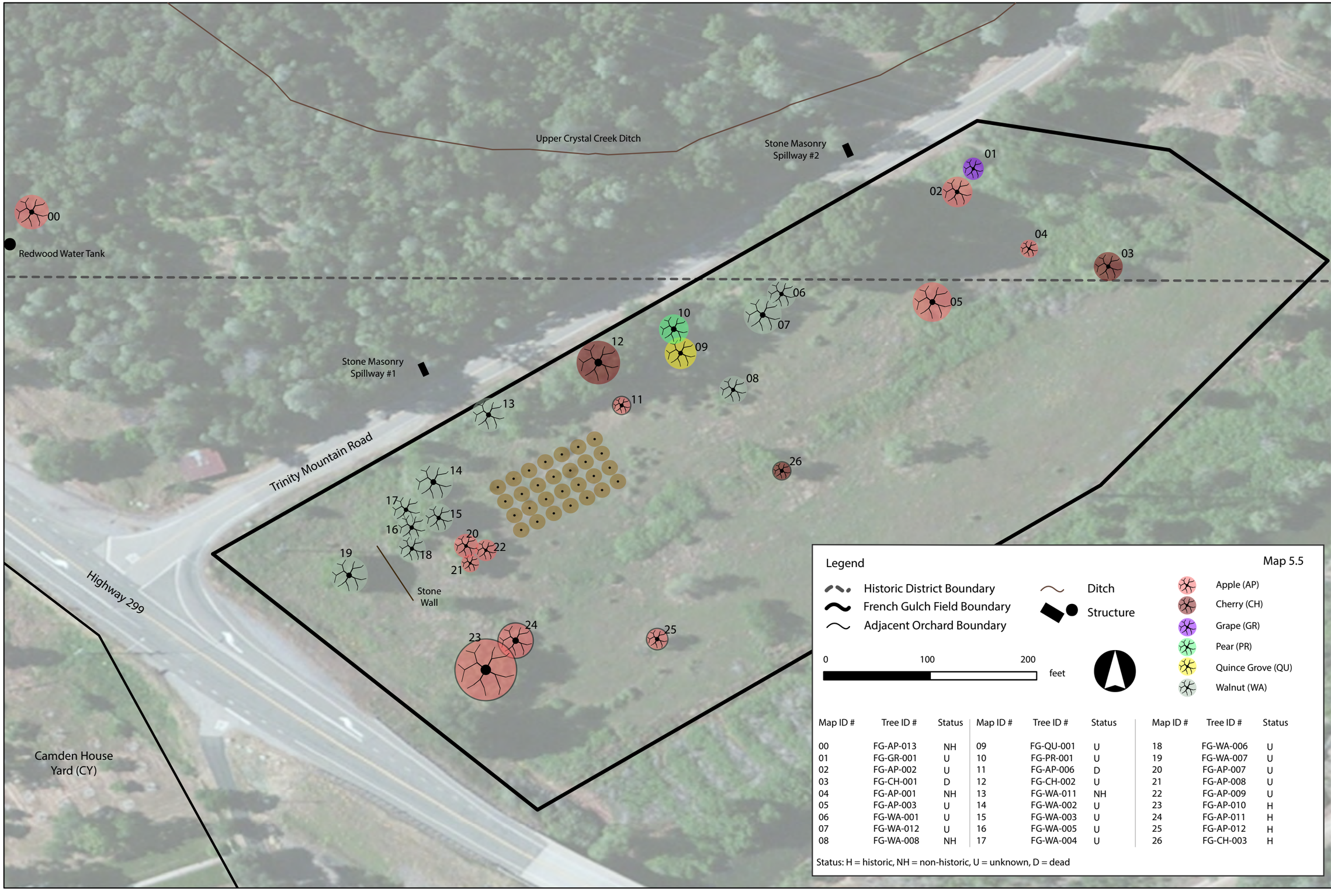
Camden House Yard (CY)

Nursery

Camden House

Interim Orchard Management Plan
Tower House Historic District - French Gulch Field (FG) | Alternative #2

Pacific West Regional Office | Cultural Landscapes Program | 2016



Legend

Map 5.5

- Historic District Boundary
- French Gulch Field Boundary
- Adjacent Orchard Boundary
- Ditch
- Structure
- Apple (AP)
- Cherry (CH)
- Grape (GR)
- Pear (PR)
- Quince Grove (QU)
- Walnut (WA)

0 100 200 feet

Map ID #	Tree ID #	Status
00	FG-AP-013	NH
01	FG-GR-001	U
02	FG-AP-002	U
03	FG-CH-001	D
04	FG-AP-001	NH
05	FG-AP-003	U
06	FG-WA-001	U
07	FG-WA-012	U
08	FG-WA-008	NH
09	FG-QU-001	U
10	FG-PR-001	U
11	FG-AP-006	D
12	FG-CH-002	U
13	FG-WA-011	NH
14	FG-WA-002	U
15	FG-WA-003	U
16	FG-WA-005	U
17	FG-WA-004	U
18	FG-WA-006	U
19	FG-WA-007	U
20	FG-AP-007	U
21	FG-AP-008	U
22	FG-AP-009	U
23	FG-AP-010	H
24	FG-AP-011	H
25	FG-AP-012	H
26	FG-CH-003	H

Status: H = historic, NH = non-historic, U = unknown, D = dead

Interim Orchard Management Plan

Tower House Historic District - Tenant House (TH) | Alternative #2

Pacific West Regional Office | Cultural Landscapes Program | 2016

Back Field (BF)

Levi Tower Grave Trail

Camden House Yard (CY)

Willow Creek

Lower Crystal Creek Ditch and Camden Water Ditch Trail

Mill Garden

Mill Creek

Legend

Map 5.6

- Historic District Bound
- Tenant House Boundary
- Adjacent Orchard Boundary
- Trail
- Creek
- Apple (AP)
- Crabapple (CA)
- Cherry (CH)
- Pear (PR)
- Cherry Plum (CP)

Status: H = historic, NH = non-historic, U = unknown, D = dead

0 100 200 feet

Map ID #	Tree ID #	Status
00	TH-CH-001	U
01	TH-CH-009	U
02	TH-CH-010	U
03	TH-CH-011	U
04	TH-CH-012	U
05	TH-CH-013	U
06	TH-AP-002	H
07	TH-AP-001	H
08	TH-AP-003	H
09	TH-AP-004	U
10	TH-AP-005	U
11	TH-PR-002	U
12	TH-AP-007	NH
13	TH-CH-003	U
14	TH-CH-005	U
15	TH-AP-008	NH
16	TH-AP-006	U
17	TH-AP-019	U
18	TH-CH-004	U
19	TH-AP-009	NH
20	TH-AP-010	NH
21	TH-PR-001	U
22	TH-CA-001	U
23	TH-GR-001	U
24	TH-AP-011	H
25	TH-AP-013	U
26	TH-AP-012	U
27	TH-AP-024	H
28	TH-CP-001	U
29	TH-AP-014	U
30	TH-AP-015	U
31	TH-AP-016	U
32	TH-AP-017	U
33	TH-CH-015	U
34	TH-CH-014	U
35	TH-CH-016	U
36	TH-AP-022	U
37	TH-AP-021	U
38	TH-AP-020	U
39	TH-AP-023	U
40	TH-CH-008	U
41	TH-AP-018	U

Alternative #3

Camden House Yard

Recommendations:

- Stabilize and preserve existing historic fruit and nut trees in the Camden House Yard.
- Propagate any historic germplasm from new "nursery" trees, especially where the original source tree has died.
- Remove native and exotic woody vegetation around the perimeter of the Camden House Yard to establish low, herbaceous ground cover throughout the area.
    - Northern portions of the orchard may include a Class C turf/pasture, while lawn areas associated the Camden House should include a Class B turf.
- Immediately remove all trees associated with the fruit tree staging area or "nursery" by flush cutting and remove debris from site. Also remove cages and irrigation system (pipes, sprinkler headers) associated with the fruit tree staging area or "nursery".
- Immediately remove all remaining non-historic fruit and nut trees from the Camden House Yard and allow stumps to deteriorate naturally.
- Consider large-scale rehabilitation of Camden House Yard complemented by period appropriate ornamental plants and fruit trees with completion of CLR, Part II.

Back Field

Recommendations:

- Stabilize and preserve all historic fruit and trees in the Back Field.
- Remove native and exotic woody vegetation around the perimeter as well as within the Back Field to establish low, herbaceous ground cover.
    - See orchard stabilization section for additional information regarding management of the orchard floor.
- Remove non-historic fruit trees in an effort to prepare the site for large-scale planting in the future.
    - The historic status of the persimmon grove is unknown and the grove is spreading beyond its original footprint. As a result, it is recommended that the persimmon be removed in an effort to support future large-scale planting objectives for the Back Field.
    - Prior to removal of the persimmon in the Back Field, assess the vigor of the persimmon near the Camden House and propagate if necessary.
- Propagate all historic fruit trees in the Back Field.
- Retain remnant grid associated with historic apple trees and utilize in representative orchard rehabilitation.
- Plant up to 125 replacement trees following general guidelines prescribed in the Alternative #3 map in an effort to reestablish a large representative orchard onsite.
    - Maintain historic composition of fruit tree species characteristic of the orchard by planting known cultivars of apple, pear, and cherry trees. When possible, selected cultivars should include varieties that were previously identified as present at the site through confirmed genetic identification. Period appropriate local cultivars as well as cultivars noted in the 1859 "Tower House Garden Book" may also be

selected for replanting. See Appendix for additional information.
    - Tree spacing should be representative of historic orchard grid configurations for apple and pear trees. Most commonly, apple and pear tree spacing was on a 30 x 30-foot grid, which resulted in forty trees per acre. Historically, cherry tree spacing was on a 25 x 25-foot grid; however, this alternative recommends planting the cherry trees within the established 30 x 30-foot grid in order to conform to the rest of the orchard.
    - Irrigate the Back Field by utilizing the park proposed Camden House potable water system (PMIS 154455) or consider options outlined in the preservation maintenance section of the document.
    - Establish a new temporary fence (mill lumber/peeled pole and wire) that is compatible with the historic character of the THHD around the Back Field to protect trees from wildlife damage.
        - Fence should remain in place for approximately ten years until mature scaffold limbs have established. Fence should receive frequent inspections for damage, and be repaired as necessary.
- Enhance interpretive opportunities through the dissemination of orchard information. Examples of potential interpretive opportunities include development of a downloadable phone app or a self-guided interpretive orchard brochure. Installation of an interpretive panel adjacent to the reestablished representative orchard with information regarding historic irrigation systems may also provide enhanced interpretation of the site.
    - Interpretation of the orchard spaces should be sited in a location that will not detract from the cultural landscape or hinder maintenance objectives for the orchard.
    - Panel locations may include:
        - adjacent to the Tower Gravesite;
        - along the Water Ditch Trail offering a bird's eye perspective on the orchard. Note this option requires vegetation thinning around orchard perimeter.
    - In the future, consider updating the recently completed Long Range Interpretive Plan to include the THHD orchards.

French Gulch Field

Recommendations:

- Stabilize and preserve all historic fruit and trees in the French Gulch Field.
- Remove native and exotic woody vegetation around the perimeter as well as within the upper field terrace to establish a low, herbaceous ground cover. Retain specimen oak tree along the fence line.
    - See orchard stabilization section for additional information regarding management of the orchard floor.
- Remove non-historic fruit and nut trees in an effort to prepare the site for new planting in the future.
- Preserve and maintain the quince grove adjacent to the fence line.
- Propagate all historic fruit trees in the French Gulch Field, including the quince.

- Plant approximately 100 replacement trees following general guidelines prescribed in the Alternative #3 map in an effort to reestablish a large representative orchard onsite.
    - Maintain historic composition of fruit tree species characteristic of orchard by planting known cultivars of peach and apple trees. When possible, selected cultivars should include varieties that were previously identified as present at the site through confirmed genetic identification; however, this is not possible since there are no peach trees extant in the THHD. Period appropriate cultivars noted in the appendix may be selected for replanting.
    - Tree spacing should be representative of historic orchard grid configurations for peach trees. Most commonly, peach tree spacing was on a 15 x 20-foot rectangular alignment, which resulted in a higher density of trees per acre than apples and pears.
    - Preserve and maintain remaining portions of the fence line and establish a new temporary fence (mill lumber/peeled pole and wire) that is compatible with the historic character of the THHD around the remainder of the French Gulch Field to protect trees from wildlife damage.
        - Fence should remain in place for approximately ten years until mature scaffold limbs have established. Fence should receive frequent inspections for damage, and be repaired as necessary.
    - Stabilize and preserve the irrigation system through reestablishing components of the ditch system near the Yreka Road trace.
        - Irrigate proposed fruit trees using the rehabilitated Upper Crystal Creek Ditch and associated flume systems associated with stone masonry spillway #1 and stone masonry spillway #2 as well as the ditch near the Yreka Road trace. Park may also consider alternate flood irrigation strategies without rehabilitation of the ditch near the Yreka Road trace to protect archeological features.
- Enhance interpretive opportunities through the dissemination of orchard information. Examples of potential interpretive opportunities include development of a downloadable phone app or a self-guided interpretive orchard brochure. Installation of an interpretive panel adjacent to the reestablished representative orchard may also provide enhanced interpretive opportunities.
    - Panel locations may include:
        - adjacent to the remnant stone wall;
        - adjacent to the specimen oak tree with views of the spillways, rehabilitated orchard and ditch near the Yreka Road trace.
    - In the future, consider updating the recently completed Long Range Interpretive Plan to include the THHD orchards.

Tenant House

Recommendations:

- Stabilize and preserve all historic fruit and trees in the Tenant House.
- Allow all fruit trees associated within the "Mill Garden" to decline without intervention due to low interpretive potential and problems associated with access to the trees, which are located on the other side of Mill Creek. No new plantings are recommended for the "Mill Garden" area due to poor accessibility. Selectively thin crowns of overshading trees in the Tenant House to increase light.
- Propagate all historic fruit trees in the Tenant House.
- Plant up to forty replacement trees following general guidelines prescribed in the Alternative #3 map in an effort to reestablish two small representative orchards onsite.
    - Plant up to fifteen fruit and nut trees in the Tenant House Yard.
        - Rehabilitation activities should focus on establishing an interpretive orchard with a diverse assemblage of fruit and nut trees representative of a period home or garden orchard. When possible, selected cultivars should include varieties that were previously identified as present at the site through confirmed genetic identification. Period appropriate local cultivars as well as cultivars noted in the 1859 "Tower House Garden Book" may also be selected for replanting. See Appendix as well as the historic context section of the document for additional information.
        - Proposed trees should be planted on the northeast side of the Tenant House and south of Mill Road. Minimal planting should occur in front of the Tenant House until Part II of the CLR can provide a more comprehensive planting plan.
        - Proposed trees may include apple, pear, crabapple, quince, grape, hazelnut and cherry and do not need to be planted in a grid.
    - Plant up to twenty to twenty-five cherry trees following general guidelines prescribed in Alternative #3 map at northwestern extent of orchard area along the access road to the water distribution feature.
        - Rehabilitation of a representative orchard in this location is based on a historic precedent for cherry trees in this area based on an existing cluster of cherry trees.
        - Tree spacing should be representative of historic orchard grid configurations for cherry trees. Most commonly, cherry tree spacing was on a 25 x 25-foot grid, which resulted in a higher density of trees per acre than apples and pears.
    - Irrigate the Tenant House locations by utilizing the park proposed Tenant House potable water system or consider options outlined in the preservation maintenance section of the document.
    - Establish a new fence around both Tenant House representative orchard locations to protect trees from wildlife damage.
        - Historically, a fence constructed of milled posts and chicken wire surrounded the Tenant House yard. A permanent fence may potentially be

constructed in this location using a similar design and materials to ensure that it is compatible with the cultural landscape.

- Construct a new temporary fence (mill lumber/peeled pole and wire) that is compatible with the historic character of the THHD around the proposed cherry trees in the northwestern extent of the site. Fence should remain in place for approximately ten years until mature scaffold limbs have established. Fence should receive frequent inspections for damage, and be repaired as necessary.

- Enhance interpretive opportunities through the dissemination of orchard information. Examples of potential interpretive opportunities include development of a downloadable phone app or a self-guided interpretive orchard brochure. Installation of an interpretive panel adjacent to reestablished representative orchard near the Tenant House and proposed representative orchard at the northwestern extent of the orchard area may also provide enhanced interpretive opportunities.

Interim Orchard Management Plan

Tower House Historic District - Back Field (BF) | Alternative #3

Pacific West Regional Office | Cultural Landscapes Program | 2016

Willow Creek

Lower Crystal Creek Ditch and Camden Water Ditch Trail

Levi Tower Grave Trail

Highway 299

French Gulch Field (FG)

Camden House Yard (CY)

Nursery

Camden House

Map 5.7

Legend

- Back Field Boundary
- Adjacent Orchard Boundary
- Trail
- Creek
- Apple (AP)
- Cherry (CH)
- Pear (PR)
- Persimmon Grove (PS)

Map Key #	Tree ID #	Status	Map Key #	Tree ID #	Status
00	BF-AP-001	H	18	BF-CH-003	U
01	BF-AP-002	H	19	BF-AP-009	H
02	BF-AP-025	NH	20	BF-AP-010	H
03	BF-AP-004	H	21	BF-AP-011	H
04	BF-AP-003	H	22	BF-CH-004	U
05	BF-AP-006	H	23	BF-CH-005	D
06	BF-AP-007	H	24	BF-PR-003	U
07	BF-AP-008	H	25	BF-PR-004	H
08	BF-CH-001	H	26	BF-AP-018	H
09	BF-PR-002	U	27	BF-AP-017	H
10	BF-PR-001	NH	28	BF-PS-001	U
11	BF-AP-024	NH	29	BF-AP-016	H
12	BF-AP-023	NH	30	BF-PR-005	NH
13	BF-AP-022	U	31	BF-AP-015	H
14	BF-AP-021	U	32	BF-AP-014	H
15	BF-AP-020	U	33	BF-AP-013	H
16	BF-AP-019	U	34	BF-AP-012	U
17	BF-CH-002	NH	35	BF-CH-006	D

Status: H = historic, NH = non-historic, U = unknown, D = dead

0 100 200 feet

Interim Orchard Management Plan

Tower House Historic District - French Gulch Field (FG) | Alternative #3

Pacific West Regional Office | Cultural Landscapes Program | 2016

Upper Crystal Creek Ditch

Stone Masonry Spillway #2

Redwood Water Tank

Stone Masonry Spillway #1

Trinity Mountain Road

Highway 299

Stone Wall

Camden House Yard (CY)

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26

Map 5.8

Legend

- Historic District Boundary
- French Gulch Field Boundary
- Adjacent Orchard Boundary
- Ditch
- Structure
- Apple (AP)
- Cherry (CH)
- Grape (GR)
- Pear (PR)
- Quince Grove (QU)
- Walnut (WA)

0 100 200 feet

Map ID #	Tree ID #	Status
00	FG-AP-013	NH
01	FG-GR-001	U
02	FG-AP-002	U
03	FG-CH-001	D
04	FG-AP-001	NH
05	FG-AP-003	U
06	FG-WA-001	U
07	FG-WA-012	U
08	FG-WA-008	NH
09	FG-QU-001	U
10	FG-PR-001	U
11	FG-AP-006	D
12	FG-CH-002	U
13	FG-WA-011	NH
14	FG-WA-002	U
15	FG-WA-003	U
16	FG-WA-005	U
17	FG-WA-004	U
18	FG-WA-006	U
19	FG-WA-007	U
20	FG-AP-007	U
21	FG-AP-008	U
22	FG-AP-009	U
23	FG-AP-010	H
24	FG-AP-011	H
25	FG-AP-012	H
26	FG-CH-003	H

Status: H = historic, NH = non-historic, U = unknown, D = dead

Interim Orchard Management Plan
Tower House Historic District - Tenant House (TH) | Alternative #3

Pacific West Regional Office | Cultural Landscapes Program | 2016

Back Field (BF)

Camden House Yard (CY)

Levi Tower Grave Trail

Willow Creek

Lower Crystal Creek Ditch and Camden Water Ditch Trail

Mill Garden

Mill Creek

Legend

Map 5.9

- Historic District Boundary
- Tenant House Boundary
- Adjacent Orchard Boundary
- Trail
- Creek
- Apple (AP)
- Crabapple (CA)
- Cherry (CH)
- Pear (PR)
- Cherry Plum (CP)

Status: H = historic, NH = non-historic, U = unknown, D = dead

0 100 200 feet

Map ID #	Tree ID #	Status
00	TH-CH-001	U
01	TH-CH-009	U
02	TH-CH-010	U
03	TH-CH-011	U
04	TH-CH-012	U
05	TH-CH-013	U
06	TH-AP-002	H
07	TH-AP-001	H
08	TH-AP-003	H
09	TH-AP-004	U
10	TH-AP-005	U
11	TH-PR-002	U
12	TH-AP-007	NH
13	TH-CH-003	U
14	TH-CH-005	U
15	TH-AP-008	NH
16	TH-AP-006	U
17	TH-AP-019	U
18	TH-CH-004	U
19	TH-AP-009	NH
20	TH-AP-010	NH
21	TH-PR-001	U
22	TH-CA-001	U
23	TH-GR-001	U
24	TH-AP-011	H
25	TH-AP-013	U
26	TH-AP-012	U
27	TH-AP-024	H
28	TH-CP-001	U
29	TH-AP-014	U
30	TH-AP-015	U
31	TH-AP-016	U
32	TH-AP-017	U
33	TH-CH-015	U
34	TH-CH-014	U
35	TH-CH-016	U
36	TH-AP-022	U
37	TH-AP-021	U
38	TH-AP-020	U
39	TH-AP-023	U
40	TH-CH-008	U
41	TH-AP-018	U

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Wickson, Edward J. *California Fruits and How to Grow Them: A Manual of Methods which have yielded the Greatest Success; with Lists of Varieties best adapted to the different districts of the State of California, 4th edition.* Los Angeles: The Kruckeberg Press, 1909.

Whiskeytown National Recreation Area, Crystal Creek Water Ditch Assessment and Treatment Repair Report. Portland: Oregon, MIG, February 2015.

Appendix

Appendix I: Description of Select Fruit Cultivars in the THHD

'Collamer's Twenty Ounce'

"Another sport of the Twenty Ounce which originated in the orchard of the late J.B. Collamer, now owned by Collamer Brothers, Hilton, N.Y., was described in Volume II of "The Apples of New York," under the name Collamer. Mr. Collamer began propagating this sport about 1900. It has held its distinctive character under propagation, and I understand is regarded by those who have fruited it as a more desirable variety than the Twenty Ounce, chiefly because of its superior color. The Collamer differs from the old Twenty Ounce chiefly in being less mottled and striped, but more completely covered with red, which often extends in an unbroken blush over a considerable portion of the fruit."

— *The Rural New Yorker, Vol. IXIX, No. 4073, New York, November 19, 1910.*

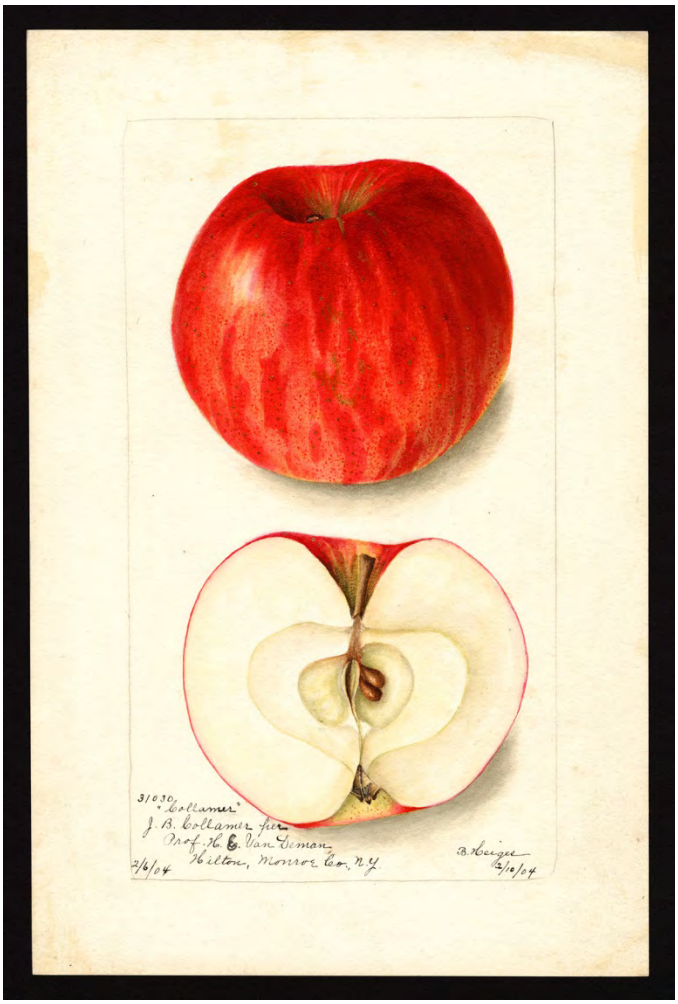

Figure A6.1: Watercolor painting of the Collamer apple (U.S. Department of Agriculture Pomological Watercolor Collection. Rare and Special Collections, National Agricultural Library, Beltsville, MD 20705).

‘Derman Winesap’

Searches for the ‘Derman Winesap’ produced no information. If the THHD orchard does contain a ‘Winesap’ the tree would likely be too old to be a ‘Derman Winesap’ unless earlier evidence of this named cultivar is found. The following article in *The Oregon Statesman* describes the apple ‘Winesap’:

> New Variety of Tree Yields Bigger Apples: WASHINGTON - Government plant breeders have developed a new variety of Winesap apple tree which, the Department of Agriculture said Tuesday should produce extra-large apples. The of chromosomes. Those are the minute structures which carry genes, the biological units that determine hereditary characteristics. Using plant surgery, Dr. Haig Derman developed tetraploid (…) at the department's Beltsville. Md. research station. The work followed discovery of a branch with the different chromosome makeup on an otherwise normal winesap tree in the J. J. Reimer orchard at Palisade, Wash. The department said scientists hope the new tree will provide breeding stock that "may help growers produce large-size apples having the high quality and disease resistance of the Winesap." Fruit from a 100 per cent tetraploid Winesap probably will be too big and irregular, the department said. But it added that used as a "parent" with other varieties, the new plant "may well produce marketable fruit of superior quality." The department said It may take five yean to learn exactly what quality and sire of fruit will come from the 100 per cent tetraploid Winesap.
>
> — *The Oregon Statesman,* Salem OR., January 4, 1956

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Figure A6.2: Watercolor painting of the Winesap apple (U.S. Department of Agriculture Pomological Watercolor Collection. Rare and Special Collections, National Agricultural Library, Beltsville, MD 20705).

‘Jonathan’

“A true American apple, the Jonathan was discovered near the beginning of the 19th century in Woodstock, NY. The President of Albany’s Horticultural Society, Jesse Buel, was first introduced to this apple through Jonathan Hasbrouck; thus, the apple’s famous name. These medium-sized, round apples have such a compelling sweet-tart taste that they are now one of the most commercially-produced apples in the United States. From the Jonathan apple tree came other delicious varieties, such as Jonafree (bred for disease resistance) and Jonagold (Jonathan x Golden Delicious).”

— *Stark Brothers Nursery website*

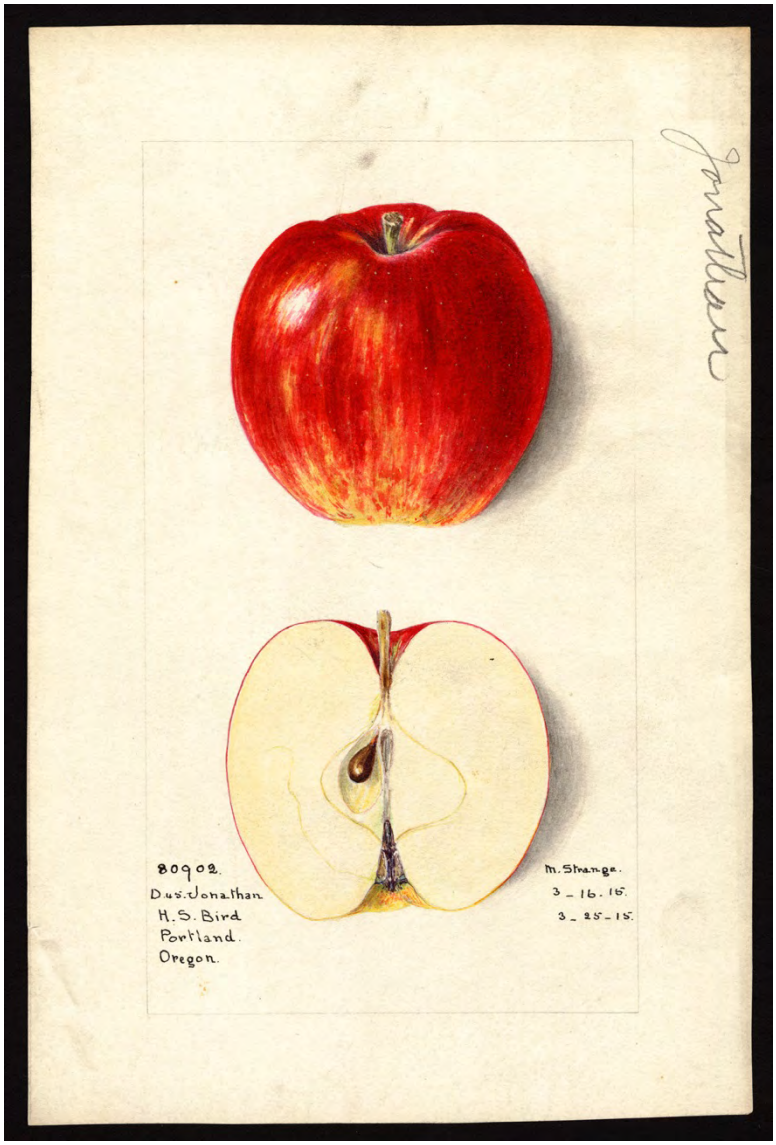

Figure A6.3: Watercolor painting of the Jonathan apple (U.S. Department of Agriculture Pomological Watercolor Collection. Rare and Special Collections, National Agricultural Library, Beltsville, MD 20705).

‘Reinette Franche’ syn. ‘French Reinette’

“(Felix) Gillet introduced this 1500’s Normandy, France variety in 1884. The fruit is medium, skin is clear yellow golden, with light brown-red flash, marbled with russet. Flesh is yellowish white, firm and crunchy. Spicy flavor with wonderful aroma, a marvelous mixture of nuts and orange. An *excellent* apple for dessert or cooking. Ripens in November-December at 2700', and keeps well into spring. The tree is productive every year, resistant to fireblight and scab.”

— *Felix Gillet Institute website*

‘White Winter Pearmain’

"This favorite fruit was brought to Indiana by some of the early pomologists, in the days of saddle-bag transportation. In a lot of grafts, two varieties, having lost their labels, were propagated and fruited without name. Being considered Pearmain-shaped, they were called respectively Red and White Winter Pearmains. The former proved to be the Esopus Spitzenberg; the latter has never yet been identified, though believed to be an old eastern variety."

— *The Apples of New York*

“High quality, all-purpose apple - an old favorite, especially for fresh use. Widely adapted, including CA's mild-winter coastal climates. Medium to large size, round to oval shape, pale yellow skin with dull red blush. Cream colored flesh is fine grained, crisp, juicy and aromatic with a rich, subacid to sprightly flavor. Good keeper. Healthy, vigorous, spreading, heavy-bearing tree. Excellent pollenizer for other apples. Believed to be the oldest known English apple, dating back to 1200 A.D”

— *Dave Wilson Nursery website*

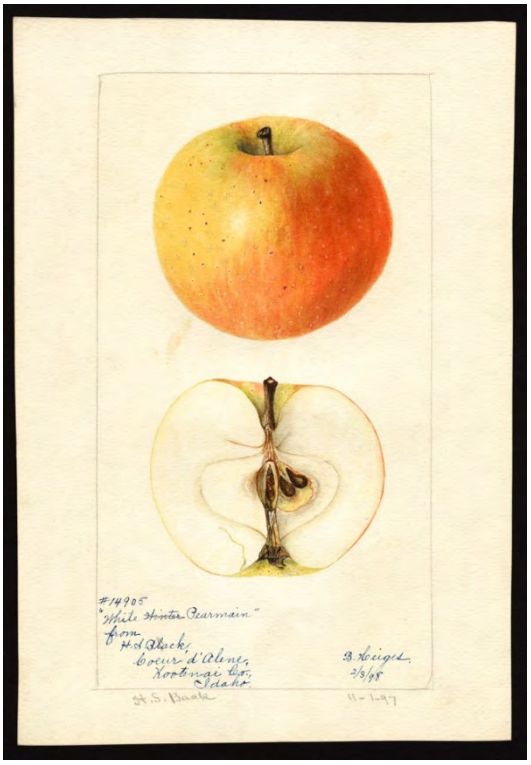

Figure A6.4: Watercolor painting of the White Winter Pearmain apple (U.S. Department of Agriculture Pomological Watercolor Collection. Rare and Special Collections, National Agricultural Library, Beltsville, MD 20705).

Appendix II: Summary of Butterfield's *History of Deciduous Fruits in California*, 1938

The following section includes a summary of the early historical development of fruit and nut trees in California. The information presented below is largely adapted from H.M. Butterfield's 1938 *History of Deciduous Fruits in California* and is intended to help the park select period appropriate cultivars where no known genetic information is available from extant fruit and nut trees within the THHD. This information may be particularly helpful when implementing treatment alternatives associated with the establishment of representative orchards and fruit trees and selection of quince, grape and/or peach cultivars is recommended. It should also be noted that additional information provided in the appendices such as information found in the 1859 "Tower House Garden Book" or in the historic context section of the document may further assist with the selection of period appropriate local cultivars.

Pears

Seedling pears were first grown in California in Spanish Mission and rancho gardens.[57] According to Butterfield, named pears were present in California as early as 1850 when a New York nursery shipped Bartlett and Seckel cultivars around the Horn to W.H. Nash and R.L. Kilburn in Napa County. Notably, A.P. Smith had also established pears in the Sacramento area by 1850 with great success. The following year, in 1851, Seth Lewelling traveled to Sacramento with a box of grafted trees, including the pear for sale.[58] In addition to the influence of Lewelling, it is likely that other people were also responsible for the early importation of pear cultivars in northern California.[59] By 1853, the Sacramento-based Warren and Sons Garden Nursery catalog (associated with Col. Warren) advertised fifty-three varieties of pears, including Bartlett, Beurre Diel, Easter Beurre, Flemish Beauty, Forelle, Glout Morceau, Louise Bonne d'Jersey, Seckel, Ubraniste, and Winter Nelis.[60] Suscol Nurseries, located approximately five miles south of Napa, was also established in 1853. The nursery's 1861 catalog listed 148 varieties of pears. Other notable nurserymen of the period included Bernard S. Fox who in 1858 owned a nursery on Milpitas Road in San Jose with 152 varieties of pears. By 1860, Fox had increased the number of pear varieties to 324 and had one million fruit trees in his nursery. Also notable was the nursery of Charles W. Reed who arrived in Sacramento in 1855. By 1867, Reed had one million trees in his operation and was reported to have shipped the first carload of pears in 1869 to the east from California.[61]

[57] H.M. Butterfield, "Early Days of California's Pear Industry," *History of Deciduous Fruits in California*, July 1938, 4. Article reprinted from *The Blue Anchor*, official publication of the California Fruit Exchange, Sacramento, California, Vols. XIV and XV, August 1937 to April 1938.
[58] H.M. Butterfield, "Pioneer Days in California's Apple Industry," *History of Deciduous Fruits in California*, July 1938, 20. Article reprinted from *The Blue Anchor*, official publication of the California Fruit Exchange, Sacramento, California, Vols. XIV and XV, August 1937 to April 1938.
[59] H.M. Butterfield, "Pioneer Days in California's Peach Industry," *History of Deciduous Fruits in California*, July 1938, 16-17. Article reprinted from *The Blue Anchor*, official publication of the California Fruit Exchange, Sacramento, California, Vols. XIV and XV, August 1937 to April 1938.
[60] H.M. Butterfield, "Early Days of California's Pear Industry," *History of Deciduous Fruits in California*, July 1938, 4. Article reprinted from *The Blue Anchor*, official publication of the California Fruit Exchange, Sacramento, California, Vols. XIV and XV, August 1937 to April 1938.
[61] Ibid., 5.

Despite the presence of several regional nurseries, it was not uncommon during this period for nurseries on the East Coast to ship their trees to California around the Horn. As a result of the long journey, the trees often arrived in poor condition; however, competitive prices for the tree stock enticed early California horticulturalists to assume the risk.

In 1854, the Highland Nurseries of New Rochelle, N.Y. were represented by the Commercial Nurseries at Mission Delores in San Francisco. At this time, their catalog contained 499 varieties of pears, including Bartlett, Bloodgood, Madeline Beurre Bosc, Beurre Clairgeau, Beurre Anjou, Beurre Diel, Flemish Beauty, Forelle, Louise Bonne d'Jersey, Seckel, Urbaniste, Beurre Easter, Glout Morceau, Pound, Vicar of Winkfield, and Winter Nelis as well as newer varieties such as Beurre Hardy, Doyenne du Comice, and Howell.

Notably, Butterfield indicated that "Levi Tower of Tower House, A.L. Downer of Shasta, C. Covillaud of Marysville, Don Manuel Requena of Los Angeles, Captain Dorsey of San Gabriel and other fruit growers had bearing trees as early as 1858, indicating that the pear was widely distributed by that time."[62] By 1859, approximately 212,650 pear trees had been planted in the state.[63]

Apples

Seedling apples were first grown in California in Spanish Mission and rancho gardens and later by the Russian-American Company at several sites including Fort Ross and Bodega Bay. Butterfield suggests that named apple varietals were present in California by 1850 when a New York nursery shipped several apple trees, including the Rhode Island Greening, Roxbury Russet, Winesap, Red Romanite and Esopus Spitzenberg to Wm. H. Nash and R.L. Kilburn near Napa Valley.[64] The following year, in 1851, Seth Lewelling traveled to Sacramento with a box of grafted trees, including the apple for sale.[65]

By 1853, the Sacramento-based Warren and Sons Garden Nursery catalog (associated with Col. Warren) advertised thirty-seven apple cultivars, which included Alexander, Baldwin, Blue Pearmain, Gravenstein, Lady Apple, Maiden Blush, Northern Spy, Porter, Red Astrachan, Red Siberian Crab, Rhode Island Greening, Roxbury Russet, Winter Pearmain, Yellow Bellflower, Yellow Newton and Yellow Siberian Crab.[66] Three years later, another Sacramento nursery, owned by A.P. Smith had fifty-six apple cultivars for sale in 1856. In addition to crab apples, named varieties included Rambo, Seek-no-Further (now known as Westfield), Baldwin, Domine,

[62] H.M. Butterfield, "Early Days of California's Pear Industry," *History of Deciduous Fruits in California*, July 1938, 4. Article reprinted from *The Blue Anchor*, official publication of the California Fruit Exchange, Sacramento, California, Vols. XIV and XV, August 1937 to April 1938.
[63] Ibid., 5.
[64] H.M. Butterfield, "Pioneer Days in California's Apple Industry," *History of Deciduous Fruits in California*, July 1938, 20. Article reprinted from *The Blue Anchor*, official publication of the California Fruit Exchange, Sacramento, California, Vols. XIV and XV, August 1937 to April 1938.
[65] Ibid.
[66] Ibid., 20-21.

Jonathan and Swaar. It should be noted that Butterfield suggests that A.P. Smith, who started his nursery in 1848, was probably "among the first to grow and sell apples in California."[67] Suscol Nurseries, located approximately five miles south of Napa, was also established in 1853. The nursery's 1861 listed cultivars included Red June, Fameuse, Twenty Ounce, Hoover, Hubbardston, Monmouth Pippin, Northern Spy, Rambo, Smith's Cider, Swaar, Wagener, Bed Davis, Rome Beauty.[68]

In 1854, the Highland Nurseries of New Rochelle, N.Y. were represented by the Commercial Nurseries at Mission Delores in San Francisco. At this time, their catalog contained nearly 350 varieties of apples. In addition to the cultivars already listed, the nursery also sold Oldenberg, Early Strawberry, Alexander, Fall Pippin, Smokehouse, Twenty Ounce Pippin, Fallawater, Gloria Mundi, Northern Spy and Rome Beauty. Newer varieties were included as an appendix to the catalog and included Ben Davis, Bietigheimer, Missouri Pippin, and Nickajack.[69]

Not surprisingly, the number of apple trees in California increased rapidly during the first ten years after California became a state and was characterized by the availability of hundreds of different cultivars. By 1859, more than 775,000 apple trees had been planted in California—second only to peach trees.[70] After the first decade of rapid development the increase in the number of apple trees was relatively slow. In 1910, there were 2,482,762 bearing apple trees and by 1930 the number of bearing apple trees demonstrated only marginal increases with a total of 2,870,417 trees.[71]

Through genetic testing, several of the apple cultivars noted above have been located at the Tower House Historic District. In the future, additional cultivars may be positively identified within the THHD, furthering our understanding of the diversity of apple cultivars represented at the site during the period of significance.

Peaches

Similar to apples, peaches were first grown in California in Spanish Mission and rancho gardens and later by the Russian-American Company at several sites including Fort Ross and Bodega Bay. [72] General Bidwell started his nursery in northern California around 1851, obtaining peach trees from as far south as San Louis Rey Mission. In later years, Bidwell exhibited the Indian Blood cling peach, which he likely secured from the mission garden at the state fair. Captain Sutter also developed his orchard and vineyard around 1851, which included 3,000 trees, some of which were peach and nectarine.[73]

[67] Ibid., 21.
[68] Ibid.
[69] Ibid.
[70] Ibid., 22.
[71] Ibid.
[72] H.M. Butterfield, "Pioneer Days in California's Peach Industry," *History of Deciduous Fruits in California*, July 1938, 15. Article reprinted from *The Blue Anchor*, official publication of the California Fruit Exchange, Sacramento, California, Vols. XIV and XV, August 1937 to April 1938.
[73] Ibid.

Butterfield suggests that named peach varietals were present in California by 1851 when Seth Lewelling sold fruit trees, include peach trees in Sacramento. In addition to the influence of Lewelling, it is likely that other people were also responsible for the early importation of peach cultivars in northern California.[74] By 1853, the Sacramento-based Warren and Sons Garden and Nursery catalog (associated with Col. Warren) advertised twenty varieties of peaches including, Early Crawford, Late Crawford, Large Blood, and Old Mixton. Three years later, another Sacramento nursery, owned by A.P. Smith had thirty-seven varieties of peaches and fourteen varieties of nectarines for sale. Among the peaches were Early and Late Crawford, George the Fourth, Heath Cling, Lemon Cling, Old Mixon, freestone and cling, Smock's Free, and others popular in early days.[75] Also noteworthy, in 1855, pioneer nurserymen Chas. W. Reed traveled to Sacramento and brought with him fifteen bushels of seed and 20,000 trees. The following year, in 1856, Reed imported an additional 80,000 more trees and twenty-five bushels of seed. Over the next decade, Reed gradually increased his stock until he had over one million trees by 1867.[76]

In 1854, the Highland Nurseries of New Rochelle, N.Y. were represented by the Commercial Nurseries at Mission Delores in San Francisco. Suscol Nurseries, located approximately five miles south of Napa, was also established in 1853. At this time, the nursery's owner, Simpson Thompson, imported 450 peach trees from New York State and also planted peach pits.[77]

The cultivation and sale of peach trees skyrocketed in California between 1856 and 1858. In 1856, a group of approximately ten nurserymen had approximately one-third of a million peach trees under cultivation in the state and by 1857, there were one million peach trees in California.[78] After construction of the Transcontinental Railroad was completed in 1869, the peach industry continued to expand as new shipping methods and markets became accessible. By the 1880s and 1890s there were between three and four million peach trees under cultivation in the state (based on approximately 90 to 100 trees per acre). Between 1900 and 1910, the number ranged between seven and eight million peach trees. By 1919, the number of peach trees surpassed ten million and in 1924 there were in excess of thirteen million trees.[79]

Cherries

Sweet cherries were grown during the Spanish mission period and potentially later by the Russian-American Company at several sites including Fort Ross and Bodega Bay.[80]. Confirmed documentation suggests that sweet cherries were present in California by 1850 when a New York nursery shipped Black Tartarian and Napoleon (Royal Ann) cultivars around the Horn to W.H.

[74] Ibid, 16-17.
[75] Ibid, 17.
[76] Ibid.
[77] Ibid.
[78] Ibid.
[79] Ibid., 17-18.
[80] Ibid., 15.

Nash and R.L. Kilburn in Napa County.[81] By 1853, Warren and Sons Garden and Nursery of Sacramento catalog listed sixteen kinds of cherries, including Black Eagle, Black Heart, Black Tartarian, Elton, May Duke, Ox Heart, and White Tartarian.[82] A.P. Smith of Sacramento, one of the first early California nurserymen to list cherries, provided thirty-nine varieties of sweet cherry in his 1856 catalog, including Black Eagle, Black Heart, Black Tartarian, Early Purple Guigne, Governor Wood, Ox Heart, Napoleon, Early Richmond, Late Duke, and May Duke.[83] Also circa 1890, Felix Gillet of Nevada City offered some of the early French cultivars of cherries in his catalogs, which included Early Tarascon, April Guigne, Guigne Marbree, and Early Lamaurie.[84]

Grapes

According to Butterfield, Mission San Gabriel was the first mission to grow grapes and was often referred to as the "mother vineyard (vina madre)."[85] During this period, grape vines were transported to other missions where growing conditions were favorable. The variety now known as the Mission predominated; however, there may be evidence to suggest that Muscatel may have also been cultivated at the missions. Notably, the Mission variety has appeared under many names such as "Alicante," "Grape of Los Angeles," "California," "El Paso" and "native grape."[86]

New cultivars of grapes were introduced to California about 1850. Nurseryman A.P. Smith listed several varieties in his catalog, including Black Hamburg, Black Morocco, Black Prince, Black St. Peters, Chasselas Musque, Muscat of Alexandria, Mission, Chasselas Dore and Isabella.[87] Additionally, other nurserymen such as Simpson Thompson offered thirty-five foreign varieties of grape and twelve American varieties in his 1861 catalog.

By 1866, there were forty counties growing grapes in California. Some of the principal vineyards and wine districts of the state included: Sonoma, Buena Vista Society (1,250,000 vines); Los Angeles (2,000,000 vines); Napa Valley (1,000,000 vines); Santa Clara (1,000,000 vines); San Joaquin Valley (4,000,000 vines); El Dorado County (1,164,418 vines) and Shasta County (1,500,000 vines).[88]

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[81] H.M. Butterfield, "History of the Cherry Industry in California," *History of Deciduous Fruits in California*, July 1938, 6-7. Article reprinted from *The Blue Anchor*, official publication of the California Fruit Exchange, Sacramento, California, Vols. XIV and XV, August 1937 to April 1938.
[82] Ibid., 7.
[83] Ibid.
[84] Ibid., 8.
[85] H.M. Butterfield, "The Builders of California's Grape and Raisin Industry," *History of Deciduous Fruits in California*, July 1938, 28. Article reprinted from *The Blue Anchor*, official publication of the California Fruit Exchange, Sacramento, California, Vols. XIV and XV, August 1937 to April 1938.
[86] Ibid.
[87] Ibid., 30.
[88] T. Hart Hyatt, *Hyatt's Hand-Book of Grape Culture; or, Why, Where, When, and How to Plant and Cultivate a Vineyard, Manufacture Wines, Etc. Especially Adapted to the State of California.* (San Francisco: H.H. Bancroft and Company) 1867, 226.

Quince

Quince has been grown in California since the Spanish mission period. Rarely mentioned in literature, the Mission Quince was likely grown on Angers stock; however, very little is known about this early fruit. The first quince cultivars were planted in California by nurseryman A.P. Smith who arrived in Sacramento in 1848. Smith's 1856 catalog listed four quince cultivars, which included the Apple (Orange), Angers, Pear, and Portugal. Chinese and Japanese quince were also grown during this period; however, they were likely grown mostly as ornamentals. In addition to Smith's operation, a couple of other nurseries in northern California offered quince for sale in the 1850s. Butterfield notes that by 1859, there were 45,821 quince trees in California.[89]

In the latter part of the nineteenth century, additional quince cultivars were established in California, including the Smyrna, which was imported about 1897. Two years later, in 1899, Luther Burbank produced the Pineapple quince, followed by the Van Deman and Santa Rosa. Also, notably, Felix Gillet of Nevada City offered the Constantinople cultivar in his 1890 catalog.[90]

Walnut

Similar to many of the fruits mentioned above, English walnuts were likely first established in California on Spanish missions. These early walnuts were small and round in shape with hard shells.[91] After the mission period, subsequent English walnut plantings were established in California as early as 1846, followed by plantings throughout the 1850s. Soft-shell walnuts were introduced to California by Joseph Sexton of Santa Barbara and Felix Gillet of Nevada City. During his tenure, he imported scions of many French walnut varieties including Franquette, Mayette, Chaberte, Meylan, Parisienne, Proeparturiens, Cluster, Vourey, and others. In 1963 Butterfield noted that the "Franquette and its local derivatives are still widespread in many walnut orchards located in northern California."[92]

[89] H.M. Butterfield, "History of Persimmons, Quinces and Pomegranates in California," *History of Deciduous Fruits in California*, July 1938, 37. Article reprinted from *The Blue Anchor*, official publication of the California Fruit Exchange, Sacramento, California, Vols. XIV and XV, August 1937 to April 1938.
[90] Ibid.
[91] Harry M. Butterfield, *A History of Subtropical Fruits and Nuts in California*, University of California Division of Agricultural Sciences Agricultural Extension Service, 1963, 38.
[92] Ibid., 41.

Japanese Walnut

The Japanese Walnut (*Juglans Sieboldiana)* was introduced to California about 1860 at the Tower House. It was grown from seed and was noted with curiosity by local newspapers. Luther Burbank prepared the following description of the Japanese Walnut:

"This species is found growing wild in the mountains of northern Japan, and is, without doubt, as hardy as an oak. The leaves are of immense size, and a charming shade of green. The nuts, which are produced in extreme abundance, grow in clusters of fifteen or twenty, have a shell thicker than the English walnut, but not as thick as the black walnut, very much resembling pecan nuts. The meat is sweet, of the very best quality, flavor like butternut, but less oily, and much superior. The trees grow with great vigor, assume a very handsome form, need no pruning, mature early, bear young, and are more regular and productive than the English walnut."[93]

[93] Edward J. Wickson, *California Fruits and How to Grow Them: A Manual of Methods which have yielded the Greatest Success; with Lists of Varieties best adapted to the different districts of the State of California, 4th edition.* (Los Angeles: The Kruckeberg Press) 1909, 369.

Appendix III: Tower House Garden Book, 1859

The "Tower House Garden Book" of 1859 lists twenty-three varieties of pears, eleven varieties of apples and four varieties of plums. The following list represents a selective transcription of cultivars noted in the Tower House Garden Book based on the authors' ability to decipher the script.

Summer Pears	Winter Pears	Prunes
Madeline	Vicar of Wakefield	White Magnum Bonum
Bartlett	Winter Nelis	Jefferson
Bloodgood	Columbia	
Jargonelle	Prince Albert	

Autumn Pears	Apples
Duchesse d' Angouleme	Herefordshire Pearmain
Virgalieu or White Doyenne	Blue Pearmain
Seckel	Seek No Further
Flemish Beauty	Lady Apple
Louise Bonne of Jersey	Newton Pippin
Fondante D'Automne	Golden Bellflower
Bergamot	Gravenstein
Paradise D' Automne	Swaar
Washington	

Appendix IV: Excerpts from Felix Gillet's Barren Hill Nursery Catalog, 1884

Walnuts	American Walnuts
Proeparturiens or Fertile	Butternut or White Walnut
Late Proeparturiens Walnut	Pecan Nut
June Proeparturiens Walnut	Hickory Nut
Large-Fruited Proeparturiens Walnut	California Black Walnut
Mesange or Tit-Lark Walnut	
Cluster Walnut	
Gant or Bijou Walnut	
Mayette Walnut	
Serotina or Late Walnut	
Franquette Walnut	
Parisienne Walnut	
Barthere Walnut	
Chaberte Walnut	

Cherries	Apples
Guigne Marbree	Large Api
Bigarreau Grosse del Mezel	Golden Reinette
Glossy Black	Reinette Grise
Royale Native or Mayduke	Reinette Franche
Queen Hortense or the Wonder of Holland	Queen of Reinette
Late Purple Guigne	Winter Ramboar
Montmorency	Feuouillet Gris.
Early Black Guigne or Banman's May	Cider Apples (imported) four varieties
Black Tartarian	Red Calville—Spitzenberg, Van de Vere, Newtown Pippin, Wine Sap, Swaar, White Pearmain, Red Astrachan, etc.
Napoleon Bigarreau	
Elton's Yellow	
Early Purple Guigne	

Peaches	Pears
Hale's Early	Duchesse d' Angouleme
Early Crawford	Sugar Pear
Late Crawford	Blanquet
Early Purple	Beurre Clairgean
Red Magdalen	Doyenne d'Illiver
Nivette	Passe Crassanne
Monstrous of Done	Bergamotte
Reine de Vergers	Royale d'Hiver
French Early Yellow	Beurre Goubault
Yellow of Spain	Colmar d'Aremberg
Grosse Mignonne	Passe Colmar
Strawberry	Bartlett
	Martin-Sec.
	Winter Nellis
	Catillac
	Recently Imported Varieties—Bon Chrelien, Summer Doyenne, Gray Doyenne

Quinces	Clingstones
Portugal	Royal George
Constantinople	Day's Yellow Cling
	Twenty Ounces Cling

Table A6.1: Compilation of fruit and nut trees available from Felix Gillet's "Descriptive Catalog and Price List of Plants and Trees," Nevada City, California (1884).

Appendix V: Popular California Apple Cultivars, 1927 to 1937

Popular California Apple Cultivars[94]
Yellow Transparent
Red Astrachan
White Astrachan
Gravenstein
Alexander
McIntosh
Rhode Island Greening
Yellow Bellflower
Jonathan
King David
Tompkins King
Grimes
Winter Banana
Delicious
Golden Delicious
White Pearmain
Wagener
Baldwin
Esopus Spitzenberg
Stayman Winesap
Rome Beauty
Winesap
Gano
Yellow Newtown
Arkansas Black
Crab Apples

Table A6.2: Popular commercial cultivars in California that were considered valuable for home use between 1927 and 1937. The cultivars are generally listed in their approximate order of ripening.

[94] F.W. Allen, "Apple Growing in California", Bulletin 425, University of California, College of Agriculture, Agricultural Experiment Station, Berkeley, CA, May 1927, revised May 1937, 15-25.

Appendix VI: Sources for Heirloom Fruit, Rootstock and Orchard Supplies

Tree Suppliers:

The Arboreum Company http://www.arboreumco.com/
Burnt Ridge Nursery http://www.burntridgenursery.com/
Felix Gillet Institute http://felixgillet.org/
Greenmantle Nursery http://www.greenmantlenursery.com/
Grow Organic/Peaceful Valley Farm Supply http://www.groworganic.com/
Stark Brothers Nursery http://www.starkbros.com/
Trees of Antiquity https://www.treesofantiquity.com/
Walden Heights Nursery https://waldenheightsnursery.com/
List of other sources: https://www.crfg.org/nurlist.html

Rootstock Suppliers:

Burnt Ridge Nursery http://www.burntridgenursery.com/Rootstock/products/98/
Fedco seeds http://www.fedcoseeds.com/trees/?cat=Rootstock
Willamette Nurseries www.willamettenurseries.com/

Watering Devices:

Treegators http://www.treegator.com/
Waterboxx http://www.dewharvest.com/
Kolaps-a-tank http://www.burchmfg.com/

Grafting Tools:

Omega grafter http://www.amleo.com/grafting-tool/p/GT3/
Grafting knives http://www.hidatool.com/gardening/knives%20for%20gardening%20tools
Parafilm tape http://www.parafilm.com/products#nursery

Tree ID Labels:

Plant Maps tree labels http://www.plantsmap.com/
National Band & Tag Co. https://nationalband.com/horticulture-tags/

Supplemental Information

- Sample Fruit Tree Condition Assessment Form
- Foundation Plant Services 2016 Genetic Test Report
- Specifications – THHD Fruit Tree Pruning, Mulching and Site Clearing
- Diplodia Correspondence
- Preservation Maintenance Task Calendar for Orchards in the Tower House Historic District

WHIS FRUIT TREE CONDITION ASSESSMENT FORM

Park: Whiskeytown National Recreation Area **Inspected By:** **Date:**

Location: **Tree Type:** **Tree ID#**

FMSS Location # FMSS Asset # (Old ID#)

Genus: **Species:** **Variety:** **DBH:**

Tree Significance: ☐ **Historic** ☐ **Non-Historic** ☐ **Unknown**

Documentation:

Condition Assessment

☐ **Good:** Good growth with minor physical damage, defects, disease or insect damage, or minor dieback/deadwood.

☐ **Fair:** Decreased growth with moderate physical damage, defects, disease or insect damage, or moderate dieback/deadwood.

☐ **Poor:** General state of decline with little or no growth, major physical damage, defects, disease or insect damage, or major dieback or deadwood.

☐ **Dead:** Greater than 90% of crown dieback with no growth.

Insert Photo

Zone	Description	Inspection Factors							
Zone 0: Orchard Floor	Ground beyond dripline	overgrown groundcover	☐	rodent holes	☐	gopher mounds	☐	grade disturbances	☐
		encroaching vegetation	☐	accumulated debris	☐	drainage issues	☐		
Zone 1: Root System	Ground within dripline	root damage	☐	accumulated debris	☐	loss of soil	☐	root suckers	☐
		early fruit drop	☐	exposed roots	☐				
Zone 2: Trunk Base	Intersection of roots with trunk	loss of bark	☐	cavities	☐	fruiting bodies	☐	cracks or splits	☐
		girdling	☐	cankers	☐	root suckers	☐	wildlife damage	
		soil accumulation	☐	trunk flare buried	☐				
Zone 3: Main Trunk	Trunk up to scaffold limbs	unbalanced scaffolds	☐	moss/lichen cover	☐	pack rat nests	☐	decay or cavities	☐
		leaning trunk	☐	deadwood	☐	water sprouts	☐	loss of limbs	☐
Zone 4: Canopy	Scaffold limbs, branches and foliage	deadwood	☐	pests	☐	foliage discolored	☐	foliage curled	☐
		% live canopy	☐	diseases	☐	early leaf drop	☐	foliage sparse	☐
		unbalanced canopy	☐	dieback of terminal shoots	☐				
Zone 5: Above Canopy	Area above canopy	encroaching vegetation	☐	over shading	☐				

Recommendations:

Prune & Remove Deadwood Install Prop/Cable/Brace Propagate Remove Tree

Monitor for change:

Notes:

Preservation Maintenance Task Calendar for Orchards in the Tower House Historic District (THHD)

Suggested Tasks by Month:	January	February	March	April	May	June	July	August	September	October	November	December
Prune dead, diseased & damaged material												
Gopher trapping												
Spray dormant oils for overwintering pests												
Prune canopy for structure												
Brush & vegetation removal												
IPM monitoring for pests												
Mulch around trees												
Prune suckers & watersprouts												
Fertilize												
Fruit thinning to reduce load												
Mow orchard floor												
Prop heavy fruiting branches												
Irrigate new trees												
Fireblight removal												
Harvest fruit												