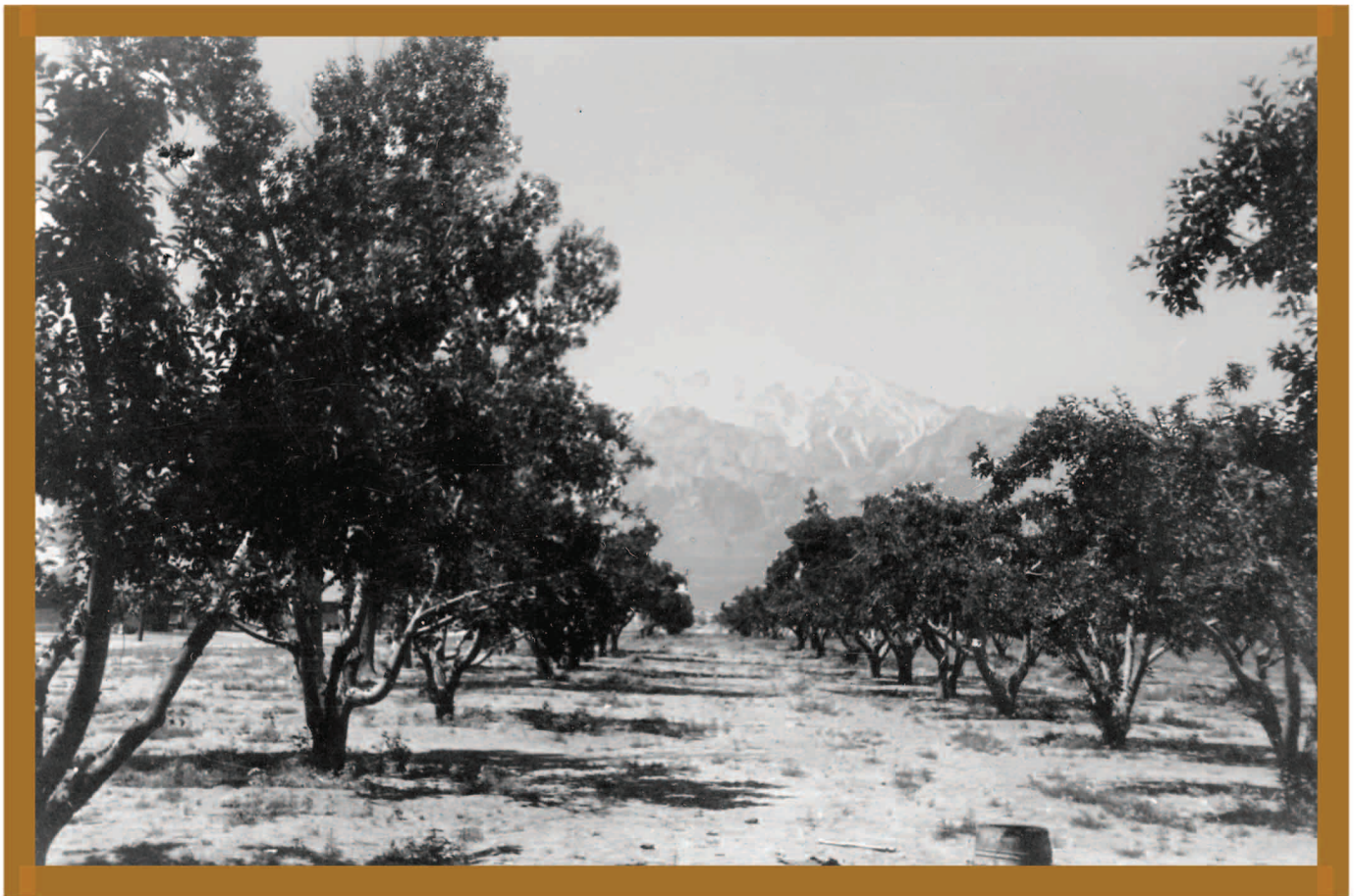




Orchard Management Plan

Manzanar National Historic Site





Orchard Management Plan Manzanar National Historic Site

**National Park Service
Pacific West Region
2010**

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INTRODUCTION

Purpose of an Orchard Management Plan

An Orchard Management Plan serves the National Park Service with objectives and guidance for day to day and long term management of park orchards. An Orchard Management Plan (OMP) tiers off the management direction provided by the park's General Management Plan and subsequent park plans, such as the Cultural Landscape Report. The OMP is intended primarily for use by resource and facility managers. To this end, this OMP for Manzanar National Historic Site consists of an analysis of existing orchard conditions, a delineation of preservation maintenance activities, and a set of treatment recommendations for future management. The defined management objectives and treatment actions are consistent with the *Secretary of the Interior's Standards for the Treatment of Historic Properties (1996)*, *Director's Order 28: Cultural Resource Management Guideline (1998)* and *NPS Management Policies (2006)*.

To tie into park maintenance operations, the OMP interfaces with the Facility Management Software System (FMSS) by providing a location/asset hierarchy and a set of recommended work orders. The OMP also includes cultural resources information on the historic context and significance of the park orchards and outlying fruit trees, which may also be of interest to education and interpretation staff. The scope of the

OMP is limited to trees grown for fruit production, rather than for shade or ornamentation. The scope does not include introduced non-native vegetation such as Black locust, Tamarisk and Black walnut trees.

Relationship to the General Management Plan (GMP)

The OMP is an implementation plan, designed to fulfill the vision for park orchards provided by the park's General Management Plan. The Manzanar National Historic Site, California: *General Management Plan and Environmental Impact Statement, 1996* (GMP) included a management vision to preserve the park's historic orchards. The orchard trees at Manzanar NHS are associated with several historic periods, including early agricultural development in the Owens Valley, the Manzanar Town Era, and the War Relocation Center Period, when many of the orchard trees were incorporated and maintained as part of the landscape. The historic remaining orchards at Manzanar have unique cultural resource and interpretive value. The GMP provides the following direction for the historic orchards:

“The orchards are recognized as major landscape features linking two principal stages in the site's history...and major extant orchards, dating from pre-camp days, would be preserved and perpetuated through cuttings or seed propagation. Irrigation would be provided as needed (GMP/EIS, pg.11).”

The GMP infers that the preservation and perpetuation of the park's historic orchards will involve propagation of new trees, derived from the original germplasm.

Relationship to the Cultural Landscape Report (CLR)

The park's *Cultural Landscape Report, 2006* provided treatment recommendations for the entire park cultural landscape, including the orchards. These recommendations created a broad philosophical framework for future treatment of the orchards, consistent with the GMP. The overriding principals are:

1. Emphasis on preservation of existing trees
2. Limited restoration of some orchards
3. Limited rehabilitation of some orchards

This OMP addresses both day to day preservation maintenance activities and future treatment of the orchards, based on the philosophical framework provided by the CLR. The OMP is designed to delineate more detailed information for treatment implementation than contained in the CLR.

Relationship to the Landscape Stabilization Plan (LSP)

The *Landscape Stabilization Plan for Manzanar National Historic Site, 2005* addresses the entire park cultural landscape, including the historic orchards. The LSP was prepared to provide interim guidance to park managers to prevent the further deterioration of cultural landscape features, in lieu of a treatment plan (CLR). At the time of preparation, many of the site's features were in very poor condition, including the historic fruit trees. The LSP delineated practical guidance for short term actions to prevent the loss of resources, including numerous stabilization

actions for the orchards. The primary objective was to retain these resources until a CLR and an OMP could be developed. The park has since implemented most of the LSP recommendations for the orchards, resulting in no further loss of trees and no further deterioration of condition. The CLR was completed in 2006. Now, the OMP builds upon the LSP with the objectives of improving the condition of the historic orchards and reinforcing their historic character through long term, on-going preservation maintenance actions and treatment implementation.

Historic Significance of Park Orchards

The Manzanar NHS orchards and the park's other remaining fruit trees are among the most outstanding examples of early 20th-century orchard horticulture in the United States. The orchards and fruit trees represent the distinct character of orchards cultivated during this period in America, and provide tangible evidence of historic activities that took place at Manzanar. The park's orchards and cultural landscape should be preserved in perpetuity through cyclic preservation maintenance and replacement in-kind.

In 1972, Manzanar was designated California Historic Landmark No. 850. Subsequent efforts led to the listing of Manzanar in the National Register of Historic Places on July 30, 1976, and on February of 1985, the property was designated a National Historic Landmark (NHL). In 1992, Congress recognized the importance of protecting and interpreting the historical, cultural, and natural resources associated with the relocation

of Japanese Americans during World War II by establishing Manzanar National Historic Site. The “Manzanar War Relocation Center” was one of ten camps where Japanese American citizens and resident Japanese aliens were interned during World War II. The site was officially transferred from the city of Los Angeles to the National Park Service on April 24, 1997.

The National Register and National Historic Landmark nominations do not include descriptions of the significance of Manzanar landscape features or the associated orchards and fruit trees. Descriptions were first provided in the Manzanar NHS Cultural Landscape Inventory (CLI) (2004) and in greater depth by the CLR (2006), where the orchards and fruit trees are identified as historic features that contribute to the significance and integrity of the Manzanar NHS cultural landscape. The CLR indicates that the overall pattern of vegetation in the Wilder and Lydston Orchards remains largely unchanged since the War Relocation Center Period, and this pattern contributes to the significance and integrity of the whole Manzanar cultural landscape. In addition, land use associated with the North Wilder and Lafon Orchards as well as fruit trees in non-orchard locations, called “Outlying fruit trees” in this document, also contribute to the cultural landscape’s significance and possess integrity of location, materials, workmanship and association. In the future, findings of the CLR and this OMP may be used to amend the NR and/or NHL nominations to more accurately reflect the significance and integrity of the Manzanar NHS cultural landscape.

The fruit trees of Manzanar NHS are associated with two periods of significance: the Manzanar Town Era, 1910 to 1924, and the War

Relocation Center period, 1942 to 1945. This Orchard Management Plan is guided by the park management objectives to manage the fruit trees within the camp barracks blocks for the War Relocation Center period, and to manage the Lydston, Wilder and Wilder North orchards for the Manzanar Town Era period.

Contribution of Park Orchards to Secondary Interpretive Themes

The historic Manzanar NHS orchards and fruit trees contribute important information about early agricultural development in the Owens Valley preceding establishment of the Manzanar War Relocation Center. While of secondary significance to the historic themes associated with the Relocation Center, themes associated with early 20th century agricultural endeavors, which include early economic development through the Owens Valley Improvement Company (OVIC) colony at Manzanar, and early settlement patterns related to land ownership and water rights are also significant.

The Manzanar NHS fruit trees are evidence of horticultural trends that occurred in the Owens Valley between 1910 when the orchards were established, and 1924 when the city of Los Angeles purchased the OVIC holdings and associated water rights. Orchard horticultural trends in this period were focused on increased profitability through operational efficiencies, such as pruning to reduce the size of fruit trees on seedling rootstocks (by low-heading trees), growing a smaller number of varieties,

using cover crops, and increasing the use of mechanization in irrigation, cultivation, grading, packing and transportation.

In addition to the early 20th century characteristics of orchards and singular fruit trees at Manzanar NHS, these resources are primarily significant for their association with the Relocation Center. Between 1942 and 1945, the camp occupied land that had been owned by OVIC and had become the town of Manzanar. During this period, remnant trees from the Manzanar Town Era were incorporated into the layout of the camp. The camp grid incorporated whole orchards within the open blocks of firebreaks and singular fruit trees within the blocks to be developed with barracks. Skilled internees maintained the fruit trees and harvested the fruit for consumption. Camp fruits, such as pears and apples, were served in the mess halls, where they supplemented the limited diets of internees. Singular fruit trees within residential blocks provided shade between barracks, ornament and a distraction from the privations of camp life. Today, the extant orchards and fruit trees provide insights into the values and needs of internees, as well as the operations of the camp.

This OMP identifies the species and varieties of fruit trees grown at Manzanar during the significant periods: the Manzanar Town Era, 1910 to 1924 and the Manzanar War Relocation Center Period, 1942 to 1945. Information provided on historic tree form, orchard configuration and tree spacing during these significant periods is derived from analysis of extant historic trees and from a 2009 NPS historic context that traces the horticultural history of American orchards, *Fruitful Legacy: A Historic Context of Orchards in the United States*. *Fruitful Legacy* provides a

national and regional context of horticultural trends within which the orchards of Manzanar NHS can be compared and associated.



Figure 1: Owens Valley fruit trees in bloom, ca. 1930 (County of Inyo, Eastern California Museum).

EXISTING CONDITIONS

Historical Introduction

Manzanar NHS is located in Inyo County of eastern California, approximately twelve miles north of Lone Pine and five miles south of Independence. Physiographically, the park is located within the Owens Valley, an arid region drained by the Owens River. The valley is bounded on the west by the Sierra Nevada Mountains and on the east by the White-Inyo Mountains. The mountain peaks on either side (including Mount Whitney) reach above 14,000 feet in elevation, while the floor of the Owens Valley is at approximately 4,000 feet, making the valley one of the deepest in the United States. The Sierra Nevada casts the valley and the park in a rain shadow, creating a high desert environment with five to six inches of rainfall per year. The valley provides water to the Los Angeles Aqueduct, the source of water for the city of Los Angeles.

In 1910, the Owens Valley Improvement Company (OVIC), headed by water developer George Chaffey, secured water rights to Bairs and Shepherd Creeks to establish an agricultural community on lands that would become the Manzanar War Relocation Center. The company coined the term Manzanar or “apple orchard” in Spanish, as the name of their town development. OVIC’s plan for the community included the production of various apple varieties, including Winesap, Esopus Spitzenberg, Rome Beauty, Delicious, Newtown Pippin and Arkansas Black. Former settlers and new residents also grew other fruits, such as peaches, pears and grapes, adding a diversity of species to the local

bounty.¹ By the early 1920s, orchards around the town of Manzanar were producing a significant amount of fruit, and growers had shifted emphasis from apple to pear growing. The area was promoted in marketing campaigns and became recognized as a favorable location for fruit-growing. By the time many fruit trees reached peak production, the Los Angeles Department of Water and Power (LADWP) began to acquire large tracts of land in the valley. LADWP's primary interest was the protection of the watershed for the Los Angeles Aqueduct and the acquisition of more water rights, rather than continued orchard operations. As a result, many residents of the town of Manzanar sold their properties and relocated and by 1934, LADWP terminated irrigation of the orchards. Subsequently LADWP cleared the land, removing many fruit trees and homes. Approximately one thousand trees were left standing, however.

Manzanar's orchards and individual fruit trees were left abandoned until the Manzanar War Relocation Center was established in 1942. This and nine other camps were operated by the War Relocation Authority (WRA) after Imperial Japan's attack on Pearl Harbor in World War II, in response to Executive Order 9066. The order allowed the military to designate areas "from which any or all persons may be excluded", and consequently, Japanese-Americans and Japanese people residing on the Pacific Coast of the United States were forcibly relocated to internment camps. At Manzanar, U.S. Army engineers laid out the camp with a gridiron of roads, barracks blocks and open firebreak blocks, layered on top of land ownership parcels from the former town of Manzanar. Extant orchards that coincided with firebreaks were retained as part of the camp plan. Extant fruit trees that coincided with the locations of

¹ *Cultural Landscape Report: Manzanar National Historic Site*, (Seattle: United States Department of the Interior, National Park Service, Pacific West Region, 2006), 149.

barracks blocks were retained as street trees or as part of small gardens. At the time of camp construction, approximately 1,000 remnant fruit trees were extant (600 apple and 400 pear trees). Some of these were located within orchards in perimeter areas surrounding the camp as well as within the camp boundaries. Under the care of several skilled Japanese-American horticulturists interned at the camp, the neglected fruit trees were reinvigorated and began to produce an abundance of fruit. Apple, pear and other fruits were harvested for use in the camp. Internees and the WRA also improved the arid camp landscape by cultivating victory gardens, creating Japanese gardens with waterfalls, ponds and stone features, and many other ornamental gardens. Internees also cultivated fields surrounding the camp for other food production.



Figure 2: Three young women internees walking among the fruit trees at Manzanar, n.d. (UCLA Special Collections).

With the end of World War II in 1945, the Manzanar War Relocation Center was abandoned, and portions of the land were reclaimed by desert scrub plant communities. The land remained undeveloped for the next five decades. In 1997 the property was acquired by the National Park Service and surviving fruit trees were recorded in a Cultural Landscape Inventory (2004), a Landscape Stabilization Plan (2005) and a Cultural Landscape Report (2006). Only the hardiest fruit trees had survived the harsh environment, which meant the predominant survivors were pear trees, a tap-rooted tree, rather than apple. Emergency stabilization efforts were undertaken in the mid 2000s. These efforts included irrigation, the removal of deadwood, rootstock suckers, epicormic growth and regular maintenance, and have significantly improved the condition of the trees. Today, a total of 144 fruit trees exist in the park. The “Existing Conditions” chapter describes the unique historic character of the Manzanar NHS fruit trees, and identifies the extant historic trees.

Chronology

- 1862:** John Shepherd homesteaded 160 acres of land three miles north of Georges Creek on the future site of Manzanar.
- 1893:** Settlements at Georges Creek and Shepherd Creek included several ranches that contained apple, pear, peach, apricot, nectarine, plum and cherry trees.
- 1904:** The city of Los Angeles began acquiring property and water rights throughout Owens Valley.

- 1905:** George Chaffey purchased the Shepherd Ranch and its associated water rights from John Shepherd.
- 1905-1910:** Chaffey acquired more than 3,000 acres of land and water rights to Shepherd and Bairs Creeks.
- 1910:** Chaffey and his associates established the Owens Valley Improvement Company (OVIC).
- 1910:** In August, OVIC laid out the first portion of its proposed colony on roughly 1,000 acres, which they had called “Manzanar,” Spanish for apple orchard.
- 1910-1920:** “...more than 28,000 orchard trees at Manzanar reached bearing age in this decade. The valley’s apples and honey consistently took prizes at the San Francisco Midwinter Fair and the Lewis and Clark exposition in Portland”.²
- 1911:** OVIC published a color promotional brochure that endorsed apple growing at Manzanar, luring settlers with the promise of “*Fortunes in Apples in Owens Valley, Inyo County, California*”.
- 1911:** Town residents Ira L. Hatfield and W.B. Engle planted 50 acres of apple trees on their individual farms, and promoted future settlement through their membership in the Manzanar Commercial Club.
- 1911-1912:** Roads were graded and buildings, including a two-room schoolhouse, community hall, cannery, garage, blacksmith shop, and stove were built at Manzanar.

² William L. Kahl, *Water and Power: The Conflict over Los Angeles’ Water Supply in the Owens Valley* (Berkeley: University of California Press, 1983), 223.

- 1911-1924:** In addition to apples, Manzanar residents planted alfalfa, corn, wheat, onions, potatoes, pears, peaches and grapes.
- 1912:** A highway was constructed between Independence and Manzanar, which was later incorporated into HW 395.
- 1917:** Apple growing “was regarded as the most promising and important crop in the valley after alfalfa. . .” Owens Valley apples had won numerous medals at various fairs and exhibits over the years demonstrating their high quality.³
- 1917:** Approx. 14,500 bearing pear trees 3,150 non-bearing trees were reported in Inyo County.
- 1917:** Approx. 94,000 bearing apple trees and 60,000 non-bearing trees were reported in Inyo County.
- 1918:** The Manzanar Fruit and Cannery Association was organized to “conduct and carry on . . . the business of canning, preserving, drying, packing and otherwise handling, disposing of and selling all kinds of deciduous and other fruits, and all kinds of vegetables”.⁴
- 1922:** The Owens Valley Apple Growers’ Association packed approximately 12,500 boxes of apples.
- 1922-1926:** Los Angeles began to purchase land and water rights within the community of Manzanar, seeking to increase the amount of water delivered to the city via the LA aqueduct from Owens Valley.

³ Robert A. Sauder, *The Lost Frontier: Water Diversion in the Growth and Destruction of Owens Valley Agriculture* (Tucson: University of Arizona Press, 1994), 131-133.

⁴ Cultural Landscape Report: Manzanar National Historic Site, 20.

- 1924:** Los Angeles purchased all of OVIC property at Manzanar, including all of the town and the surrounding subdivisions.
- 1926:** The city of Los Angeles managed the orchards located within the boundaries of its newly acquired property and continued operating the packinghouse located in the town's community hall for several years thereafter.
- 1926:** The Manzanar fruit crop included six carloads of peaches, twelve of Bartlett pears, and thirty-seven carloads of apples. The apples were mostly Winesaps, with some Delicious and Arkansas Black varieties.
- 1927:** According to the *Los Angeles Times Farm and Orchard Magazine*, November 30, 1927 edition, "There were approximately 300 acres of orchard, the "major portion of which has not yet attained a full-production stage".
- 1930s:** After Los Angeles acquired the land at Manzanar, they quickly removed traces of the agricultural colony. Homes and barns were torn down and fruit trees were cut down or uprooted.
- 1934:** Los Angeles ceased irrigating the agricultural fields associated with Manzanar to increase groundwater pumping in its continuing effort to satisfy municipal water needs from Owens Valley.
- 1935:** The Los Angeles Department of Water and Power asked the last remaining resident, a poultry farmer named Clarence Butterfield, to vacate his premises.

- 1941:** On October 6, the Inyo County Board of Supervisors passed a resolution at the request of the city of Los Angeles that “all streets, alleys, lanes, etc. in the Town of Manzanar” be abandoned.
- 1942:** On February 19, President Roosevelt signed Executive Order 9066, which authorized the Secretary of War to “prescribe such military areas in such places and of such extent . . . from which any or all persons may be excluded”.
- 1942:** On March 7, General DeWitt announced the army had acquired a satisfactory site in the Owens Valley for a “processing station” to house 10,000 to 15,000 persons of Japanese ancestry.
- 1942:** On March 18, President Roosevelt created the War Relocation Authority (WRA), by Executive Order 9102, an independent civilian authority responsible for formulating and executing a relocation program.
- 1942:** The Manzanar Free Press reported that the neglected orchard of “600 apple and 400 pear trees” had been rehabilitated.
- 1942:** A crew of 20 men dug irrigation ditches, thinned the orchard to increase light, and pruned individual trees to enhance yield.
- 1942:** Orchard foreman Takeo Shima’s assistants Hideo Marumoto, Gummi Watanabe and their crews picked 4,000 crates of Bartlett and Winter Nellis pears.

Newtown Pippin, Winesap and Yellow Belleflower apple varieties were also harvested.

- 1943:** A large-scale landscaping project began in the hospital block. Flowerbeds were established, and locust, birch, poplar, pine and pear trees were transplanted to the site from other locations in the camp, including the fruit orchards.
- 1945:** The last evacuees left Manzanar on November 21.
- 1946:** The War Relocation Authority (WRA) administered Manzanar until March 10, when control was transferred to the General Land Office.
- 1972:** Manzanar was designated California Historic Landmark No. 850 in 1972.
- 1976:** Manzanar was listed in the National Register of Historic Places.
- 1985:** Manzanar was designated a National Historic Landmark.
- 1992:** Congress recognized the importance of protecting and interpreting the historical, cultural, and natural resources associated with the relocation of Japanese Americans during World War II by establishing the Manzanar National Historic Site.
- 2005-present:** Following an assessment of remaining orchard and landscape trees at Manzanar, park staff implemented a series of stabilization measures, greatly improving the condition of the extant historic fruit trees.

Existing Conditions Summary

In 2010, the park contains 6.7 acres of historic orchards: the remnants of the Wilder, Wilder North, Lafon, and Lydston Orchards. Their names are derived from the owners of the early 20th century farms around the town of Manzanar. In addition to the orchards, individual fruit trees, called the “outlying fruit trees” in this document, are found throughout the park, where they were cultivated during the War Relocation Center Period in parks, gardens and residential blocks. The park’s orchards are delineated by the remnants of a historic road grid system established during the camp period. During this time, the orchards were flood-irrigated through a system of irrigation ditches, concrete pipes, wells and reservoirs. Today, most orchards are watered by a drip irrigation system, fed by a historic well located north of the Wilder North Orchard.

The Lydston and Wilder Orchards are the two largest and most intact orchards. These orchards were laid out by species and variety and retain many historic fruit trees, primarily the Comice pear variety in the Lydston Orchard and the Bartlett variety in the Wilder Orchard. Most of the historic pear trees remaining at Manzanar NHS are located in these orchards on the northwest side of the camp where the water table is naturally higher. Two smaller orchards, the Wilder North and Lafon Orchards, are also extant. These orchards collectively contain less than a dozen historic trees and do not retain a clearly evident grid. Both orchards contain several pear trees. No intact apple orchards remain at Manzanar NHS; however, two historic apple trees survive in the Lafon Orchard, in very poor condition. The outlying fruit trees include European pear, Asian pear, peach, fig and apricot. Some of these trees

are historic variety trees, and others are seedling trees, having been generated from rootstock sprouts or by seeds spread from original trees since the historic period. See “Descriptions of Individual Orchards”, for more information.



Figure 3: Orchard at Manzanar, looking toward the Sierra Nevada Mountains. Note guard tower on left side of historic photo (County of Inyo, Eastern California Museum).

2010 Summary Table of Existing Orchards and Outlying Fruit Trees						
Orchard/ Location	Tree No.	Species	Variety	Other	Historic/ Non Historic	Tree Management
Lydston	LY-1-P	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
	LY-3-P	Pear	Comice	N/A	Historic	Preserve
	LY-4-P	Pear	Comice	Combined	Historic	Preserve
	LY-8-P	Pear	Comice	Combined	Historic	Preserve
	LY-13-P	Pear	Comice	N/A	Historic	Preserve
	LY-14-P	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
	LY-16-P	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
	LY-17-P	Pear	Comice	Combined	Historic	Preserve
	LY-18-P	Pear	Comice	N/A	Historic	Preserve
	LY-20-P	Pear	Comice	N/A	Historic	Preserve
	LY-24-P	Pear	Comice	N/A	Historic	Preserve
	LY-25-P	Pear	Comice	N/A	Historic	Preserve
	LY-28-P	Pear	Comice	N/A	Historic	Preserve
	LY-31-P	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
	LY-34-P	Pear	Comice	N/A	Historic	Preserve
	LY-37-P	Pear	Comice	N/A	Historic	Preserve
	LY-39-P	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
	LY-42-P	Pear	Comice	N/A	Historic	Preserve
	LY-43-P	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
	LY-45-P	Pear	Comice	N/A	Historic	Preserve
LY-46-P	Pear	Comice	N/A	Historic	Preserve	
LY-47-P	Pear	Comice	N/A	Historic	Preserve	
LY-50-P	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree	
LY-53-P	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree	
Lafon	LF-6-A	Apple	Newtown Pippin	N/A	Historic	Preserve
	LF-9-A	Apple	Unknown	N/A	Historic	Preserve
	LF-10-P	Pear	Comice	N/A	Historic	Preserve
	LF-11-P	Pear	N/A	Rootstock	Non Historic	May be removed
	LF-12-P	Pear	Comice	N/A	Historic	Preserve
Wilder N.	B33-1-1	Pear	Bartlett	N/A	Historic	Preserve

Wilder N. (contd.)	B33-1-2	Pear	N/A	Rootstock	Non Historic	May be removed
	B33-1-3	Pear	N/A	Rootstock	Non Historic	May be removed
	B33-1-5	Pear	N/A	Rootstock	Non Historic	May be removed
	B33-1-6	Pear	N/A	Rootstock	Non Historic	May be removed
	B33-1-7	Pear	N/A	Rootstock	Non Historic	May be removed
	B33-1-8	Pear	Comice	N/A	Historic	Preserve
	B33-1-9	Pear	Bartlett	N/A	Historic	Preserve
	B33-1-10	Pear	Bartlett	N/A	Historic	Preserve
	B33-1-11	Pear	N/A	Rootstock	Non Historic	May be removed
Wilder	6F-1-3	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-4	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-5	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-6	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-7	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	6F-1-8	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-9	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-10	Pear	Bartlett	Combined	Historic	Preserve
	6F-1-11	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-12	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-13	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-15	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-16	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-17	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-18	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	6F-1-19	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	6F-1-20	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-21	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	6F-1-22	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-23	Pear	Bartlett	N/A	Historic	Preserve
6F-1-24	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree	
6F-1-25	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree	
6F-1-26	Pear	Bartlett	N/A	Historic	Preserve	

Wilder (contd.)	6F-1-27	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-28	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-29	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	6F-1-30	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	6F-1-31	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-32	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-33	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-34	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-35	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-36	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-38	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	6F-1-39	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	6F-1-41	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-43	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	6F-1-44	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-45	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-46	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-48	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-49	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	6F-1-51	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-52	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-53	Pear	Comice	N/A	Historic	Preserve
	B28-1-1	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
	B28-1-2	Pear	Comice	N/A	Historic	Preserve
	B28-1-3	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
	B28-1-4	Pear	Comice	N/A	Historic	Preserve
	B29-1-1	Pear	Comice	Combined	Historic	Preserve
	B29-1-2	Pear	Comice	Combined	Historic	Preserve
	B29-1-3	Pear	Comice	Combined	Historic	Preserve
	B29-1-4	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	B29-1-5	Pear	Comice	N/A	Historic	Preserve
	B29-1-7	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	B29-1-8	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree

	B29-1-9	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	B29-1-10	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	B29-1-11	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	B29-1-12	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	B29-1-13	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	B29-1-15	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	B29-1-16	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
	B29-1-17	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
Outlying Fruit Trees Block 12	B12-1-1	Fig	Unknown	N/A	Probably Historic	Preserve
	B12-1-2	Fig	Unknown	N/A	Probably Historic	Preserve
	B12-1-3	Fig	Unknown	N/A	Probably Historic	Preserve
	B12-1-4	Apricot	N/A	Rootstock	Non Historic	May be removed
Block 14	B14-1-1	Peach	N/A	Rootstock	Non Historic	Preserve
	B14-1-2	Peach	N/A	Rootstock	Non Historic	Preserve
Block 22	B22-1-1	Pear	N/A	Rootstock	Non Historic	May be removed
Block 28	B28-1-5	Pear	Comice	N/A	Historic	Preserve
	B28-1-6	Pear	N/A	Rootstock	Non Historic	May be removed
Block 29	B29-1-1	Peach	N/A	Rootstock	Non Historic	Preserve
	B29-1-2	Peach	N/A	Rootstock	Non Historic	Preserve
Children's Village	CV-1-1	Pear	Bartlett	N/A	Historic	Preserve
	6F-1-54	Pear	N/A	Rootstock	Non Historic	May be removed
Hatfield Orchard Remnant	P13-1-1	Pear	N/A	Rootstock	Non Historic	May be removed
	P13-1-2	Pear	N/A	Rootstock	Non Historic	May be removed
	P13-1-3	Pear	N/A	Rootstock	Non Historic	May be removed
	P13-1-4	Pear	N/A	Rootstock	Non Historic	May be removed
	P13-1-5	Asian Pear	N/A	Rootstock		
	P13-1-6	Pear	N/A	Rootstock	Non Historic	May be removed
	P13-1-7	Pear	N/A	Rootstock	Non Historic	May be removed
	P13-1-8	Pear	N/A	Rootstock	Non	May be removed

					Historic	
Hatfield (contd.)	P13-1-9	Pear	N/A	Rootstock	Non Historic	May be removed
	P13-1-10	Pear	N/A	Rootstock	Non Historic	May be removed
	P13-1-11	Pear	N/A	Rootstock	Non Historic	May be removed
Hospital Complex	HC-1-1	Pear	N/A	Rootstock	Non Historic	May be removed

Historic Character of Orchards and Fruit Trees at Manzanar

The historic fruit trees of Manzanar NHS exhibit the character-defining features of orchard horticulture between 1880 and 1945: namely short trunks; full size trees (seedling rootstocks); open-bowl form; wide spacing, and just a few varieties present. An important horticultural innovation of this period resulting from the creation of the United States Department of Agriculture was the reduction in height of tree trunks, known as “low heading”. Through pruning of the young tree, the trunk was rendered less than three feet tall and the major limbs or scaffold were shaped into a “central leader” or an “open-bowl” pruning style. The low-headed trunk and open-bowl form are two character-defining features evident in the historic Manzanar NHS fruit trees.

Other period orchard innovations included increased tree spacing within the grid to maximize the yield from full size trees, planting a smaller number of varieties of each species, and selecting just the most commercially valuable varieties. The Manzanar NHS fruit trees have a wide spacing pattern, and are planted in multiple rows of one variety. The pear varieties found in the park were the most commercially valuable varieties in California in the early 20th century: Bartlett and Comice. Prior to this period in orchard horticulture, fruit trees were characterized by tall, unbranched trunks of generally five or more feet in height and an unpruned form rather like a deciduous forest tree, with a canopy like an unwieldy thicket. Earlier in the 19th century, fruit trees were grown at tight spacing for their large size, and many varieties were grown within the rows of each orchard. Other innovations of the 1880 to 1945 period

include the widespread adoption of irrigation systems, the use of pesticides, and the sowing of cover crops on the orchard floor.

During the Manzanar Town Era, variety fruit trees would be grafted onto a seedling rootstock that produced a standard, full size tree. After World War II, horticultural research led to the development of clonal dwarfing rootstocks for most orchard species, leading to the miniaturization of fruit trees and a vast reduction in orchard spacing. All of the extant variety trees in Manzanar NHS are full-size, standard trees, grafted onto seedling rootstocks. In addition to variety trees, however, “rootstock sprout trees” have grown up within each historic orchard and in the outlying fruit tree areas. Some rootstock sprouts have evolved from the root zone of historic trees, while others have sprouted between orchard rows, as a result of suckering beneath the ground. Rootstock sprouts between the rows are incompatible with the orchard landscape and should be removed. Rootstock sprouts from the root zones of historic trees have some temporary value for the visitor experience and may provide potential rootstock propagation material in the future. The long term goal, however, as identified in the “Treatment Plan” section, is to replace rootstock sprout trees with true variety trees.

The scaffold form of the trees located at Manzanar are “low headed,” with trunks shorter than three feet tall. Pruning fruit trees into a low-headed style was an innovation of the 1880s, which was adopted throughout American orchards and used as the typical style until the 1950s. Significantly, shorter trunks such as these dramatically reduced tree height, which made the tree canopy more accessible for working from the ground. Low headed trees were also known to fruit sooner in

their lives than trees with taller trunks. Today, the fruit tree canopies at Manzanar NHS are losing their low-headed character, due in large part to elk grazing. Where scaffold limbs have been lost from the low headed trunk, new, low scaffold limbs cannot be re-developed due to browsing. As a result, the historic trees are evolving into a “limbed-up” state, uncharacteristic of their period in orchard history. Orchard fencing is recommended to restore the historic scaffold form of the park’s fruit trees. See “Fencing” for more information.



Figure 4: Rows of fruit trees at Manzanar (County of Inyo, Eastern California Museum).

In the early 20th century, orchard tree spacing was regular and wide, allowing draft horses and vehicles to move and turn between the rows and columns of trees. Apple and pear orchards were planted in a 30 by 30-foot grid (40 trees per acre), while smaller species such as plum, apricot and peach were planted in a 22 by 22-foot grid (60 trees per acre).

The spacing or grid pattern found at Manzanar NHS is somewhat unusual for its time, being tighter in pear orchards than was typical for this period. In the Lydston Orchard, the pear trees are spaced on a 15 by 24-foot grid, and in the Wilder Orchard on a 15 by 30-foot grid. This untypically tight spacing is probably due to the presence of “filler trees” in these orchards. Filler trees were an innovation of early 20th century orchards, when they helped to expedite revenues for growers of young orchards. Filler trees of varieties that were quicker to bear fruit would be inter-planted between rows of permanent trees, and would be in place for ten or twenty years before removal. Had the City of Los Angeles not bought the property in 1924, the filler trees would probably have been removed to make more space for the permanent trees. Instead, the unusually tight spacing is a testament to an unforeseen change in land use management.

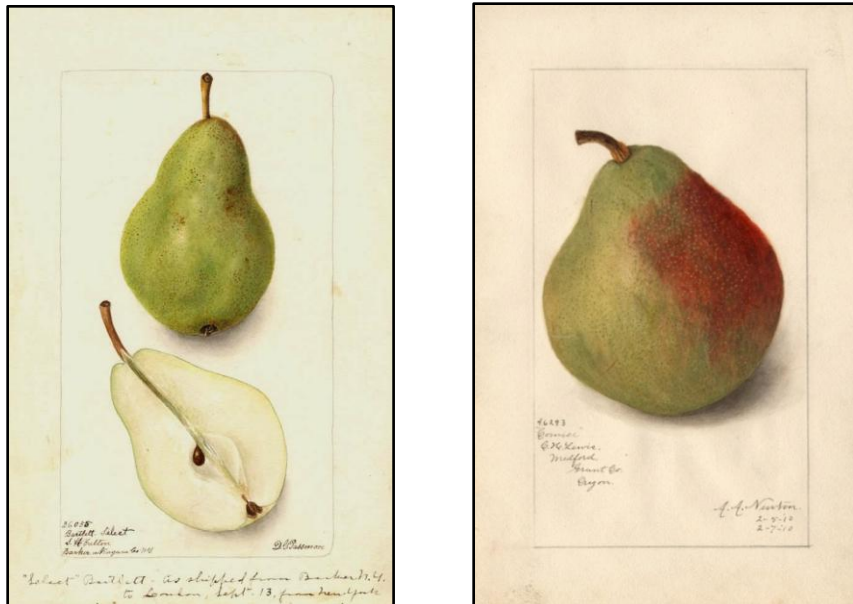


Figure 5: Watercolor paintings depicting a Bartlett pear (left) and a Comice pear (right) (USDA Pomological Watercolor Collection).

Historical records indicate that several apple varieties were grown in the area during the Manzanar Town Era. The varieties grown had a range of colors, including Delicious (red), Newtown Pippin (green), Yellow Belleflower (yellow), Esopus Spitzenburg (russeted orange-red), Winesap (pink-red), and Arkansas Black (black-red). These were among the most popular commercial apple varieties in the early 20th century and were also probably selected for their tolerance of hot growing conditions. Red Delicious is a particularly adaptable variety, and was widely planted throughout the United States in the three decades before World War II. The apple varieties planted around the town of Manzanar appear to have been more numerous than pear varieties. Many more commercial varieties of apple existed than pear, however, and compared to orchard horticulture in the 19th century, when tens of varieties would be grown in one orchard, the apple orchards of Manzanar had a small, commercially-rational number of varieties.

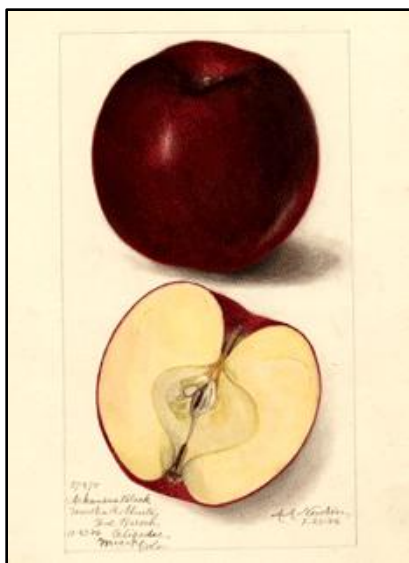


Figure 6: Watercolor painting of an Arkansas Black apple (USDA Pomological Watercolor Collection).

Field Identification Numbers

Site plans of the existing conditions accompany the following descriptions of individual orchards. On the plans, each tree has a unique identification number. This document uses a numbering system for fruit trees that was first developed for archeological features in the inventory *“Three Farewells to Manzanar, the Archeology of Manzanar National Historic Site, California,”* 1996. This system was also used to record landscape features in the 2005 the Landscape Stabilization Plan. A few trees have newer field identification numbers however, that were created by the park orchardist.

The field identification numbers consist of three parts: 1) area or location of the tree; 2) feature category #1 indicates a tree; and 3) individual feature in sequential or chronological order by location. For example, a pear tree in the Wilder Orchard numbered 6F-1-10 is located in area 6F (junction of 6th and F Streets), is a tree (1) and is the tenth individual tree recorded in this location. The letter “P” followed by a number is used to indicate that the tree is located in the perimeter of the site, while the number corresponds to the adjacent Block (e.g., P13-1-7). The letter “B” followed by a series of numbers is a reference to the block in which the tree is located. For example, a pear tree in the Wilder North Orchard numbered B33-1-3 is located in Block 33, is a tree (1) and is the third individual tree recorded in this location.⁵

⁵ For more information on field identification numbers see: Gina Bellavia and Charlie Pepper, Landscape Stabilization Plan: Manzanar National Historic Site, (Brookline, Massachusetts: Olmsted Center for Landscape Preservation), 2005.

Slight variants on the numbering system identified above exist for some orchards and outlying fruit trees. The letters “LF” followed by a series of letters and numbers is a reference to the Lafon Orchard. A tree labeled LF-9-A is located in the Lafon Orchard, is the ninth individual tree recorded. The letter “A” represents that the tree is an apple. The Lydston Orchard is numbered using a similar method (e.g., LY-16-P). A single tree identified as HC-1-1 refers to a pear tree in the Hospital Complex, while CV-1-1 notes a pear tree in the Children’s Village. (See existing conditions maps for detailed tree information.)

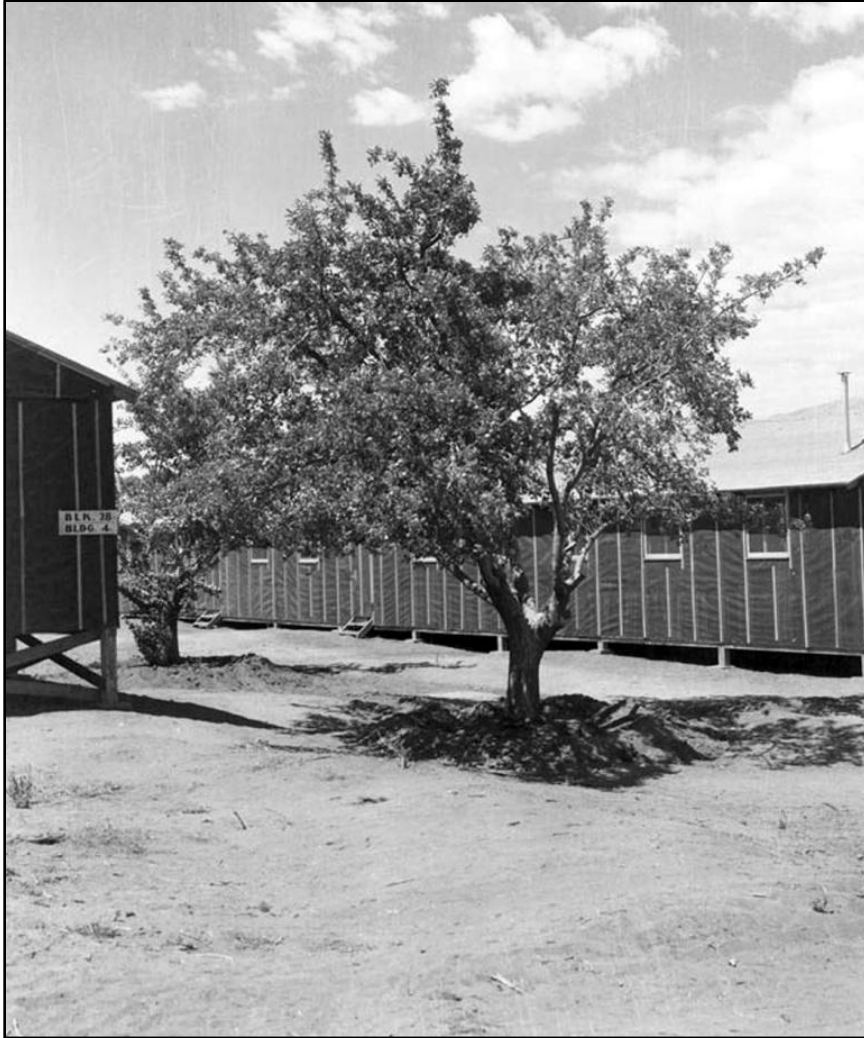


Figure 7: Individual fruit tree located in a residential block adjacent to a barracks building during the War Relocation Center Period (UCLA Special Collections).

Orchard Boundaries

The site plans of the existing conditions include a boundary around each orchard. Orchard boundaries are delineated to encompass contributing historic fruit trees associated with orchard blocks. These include the Wilder Orchard, Wilder North Orchard, Lydston Orchard and the Lafon Orchard. The delineation of boundaries is a critical step in entering facility management locations and assets into the NPS Facility Management Software System (FMSS). The park's orchards will be tracked as individual "3100-Maintained Landscape Locations" within FMSS. See the section "Facility Management Software System" for more information. It is important to note that the assigned boundaries do not represent historic orchard boundaries, which were generally larger during the Manzanar Town Era. Instead, the boundaries are based on management objectives to optimize preservation maintenance of the remaining historic orchards while limiting conflict with other park resources, such as archeological and natural resources. Boundaries are not assigned to outlying fruit trees, as these trees were not part of orchard areas in the War Relocation Center Period.



HISTORIC ORCHARD AREAS
EXISTING CONDITIONS 2010

Descriptions of Individual Orchards

Lafon Orchard

The Lafon Orchard encompasses 0.56 acres and has a total of 5 trees: 4 historic and 1 non-historic. The orchard is located east of residential Blocks 5 and 11 in the southwestern portion of the camp, on either side of 2nd Street. During the Relocation Center Period, the Lafon Orchard was incorporated into one of the camp’s firebreaks. In 2010, one tree is extant east of Block 5, and four trees remain east of Block 11. Of the five extant trees, two are apple trees, one of which is a Newtown Pippin variety and one is unknown, and two are Comice variety pear trees. These are historic trees, dating to the Manzanar Town Era in the 1910s. In addition, one rootstock sprout tree of an unknown species is located in the orchard. The rootstock sprout has grown up close to one of the historic fruit trees, and is small in stature, indicating that this tree post-dates the camp period and is therefore non-historic.

Lafon Orchard Existing Conditions					
Tree No.	Species	Variety	Other	Historic/ Non Historic	Tree Management
LF-6-A	Apple	Newtown Pippin	N/A	Historic	Preserve
LF-9-A	Apple	Unknown	N/A	Historic	Preserve
LF-10-P	Pear	Comice	N/A	Historic	Preserve
LF-11-P	Pear	N/A	Rootstock	Non Historic	May be removed
LF-12-P	Pear	Comice	N/A	Historic	Preserve

The vicinity of the Lafon Orchard also contains seven dead apple trees, and other dead trees may have been removed since the NPS gained ownership of the property. The Lafon Orchard's historic tree spacing is no longer evident in the field, but when the dead trees are factored in, a subtle stair-step layout is discernable. In historic aerial photographs, the orchard had a legible square spacing of approximately 30 feet by 30 feet. This orchard is important because it contains the sole remaining apple trees in Manzanar NHS. The name "Manzanar" translates as "apple orchard" in Spanish, reflecting a heritage of apple growing. Today, the park is threatened with losing the apple trees for which the site is named.



Figure 9: Apples from Lafon Orchard tree LF-6-A. The fruits display natural variability in color and form that is typical of Newtown Pippin variety (NPS, October 2010).



	APPLE (var. Newtown Pippin)		WOODY VEGETATION
	APPLE (var. unknown)		CAMP BLOCK NUMBER
	PEAR (var. Comice)		
	PEAR (rootstock sprout Quince)		
	APPLE - dead		

LAFON ORCHARD
EXISTING CONDITIONS 2010

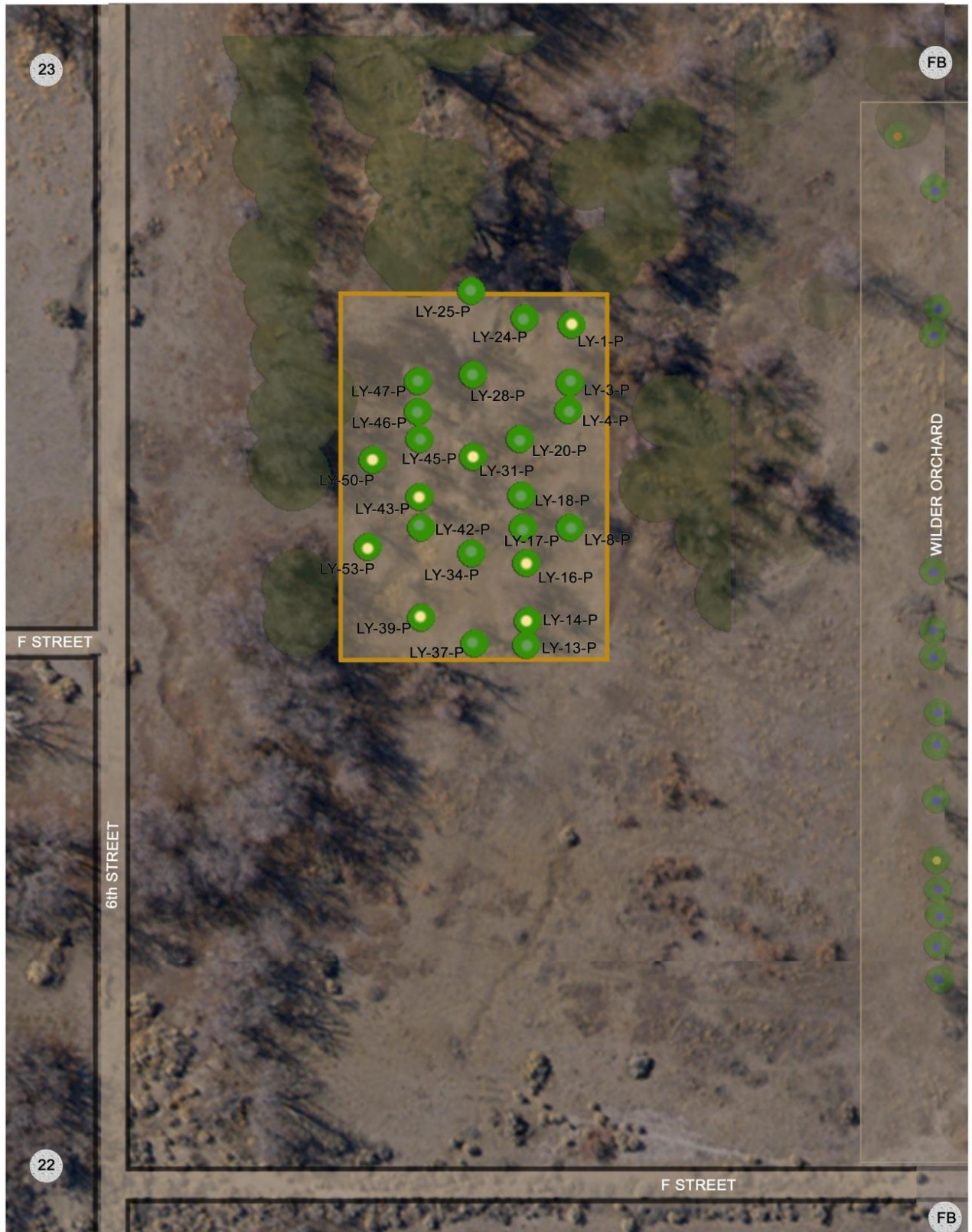
Lydston Orchard

The Lydston Orchard encompasses 0.5 acres and has a total of 24 trees: 16 historic and 8 non-historic. The orchard is located north of Block 23 in a firebreak on the northwest side of camp. Of the 24 extant trees, 16 are Comice variety pear trees that date to the Manzanar Town Era in the 1910s. In addition, eight rootstock sprout trees (quince seedling rootstock) are present in the orchard and these are non-historic. The historic tree spacing of the orchard is still evident: 15 by 24-foot spacing in five rows oriented east to west. As described earlier, this tight spacing arrangement is probably due to the presence of “filler” trees within the rows. This is a historic characteristic of the Lydston Orchard.

The rootstock sprout trees are identified as non-historic as the aerial part of these trees, the quince seedling trunk and canopy, post-dates the camp period. However, the rootstock sprout trees vary in their compatibility with the historic character of the orchard. The trees that have their roots in the original location (i.e., aligned with the rows and columns of extant historic trees) are more compatible, as they reinforce the appearance of the orchard grid and have interpretive value for the visitor experience.

Lydston Orchard Existing Conditions					
Tree No.	Species	Variety	Other	Historic/ Non Historic	Tree Management
LY-1-P	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
LY-3-P	Pear	Comice	N/A	Historic	Preserve
LY-4-P	Pear	Comice	Combined	Historic	Preserve
LY-8-P	Pear	Comice	Combined	Historic	Preserve
LY-13-P	Pear	Comice	N/A	Historic	Preserve
LY-14-P	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
LY-16-P	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
LY-17-P	Pear	Comice	Combined	Historic	Preserve
LY-18-P	Pear	Comice	N/A	Historic	Preserve
LY-20-P	Pear	Comice	N/A	Historic	Preserve
LY-24-P	Pear	Comice	N/A	Historic	Preserve
LY-25-P	Pear	Comice	N/A	Historic	Preserve
LY-28-P	Pear	Comice	N/A	Historic	Preserve
LY-31-P	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
LY-34-P	Pear	Comice	N/A	Historic	Preserve
LY-37-P	Pear	Comice	N/A	Historic	Preserve
LY-39-P	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
LY-42-P	Pear	Comice	N/A	Historic	Preserve
LY-43-P	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
LY-45-P	Pear	Comice	N/A	Historic	Preserve
LY-46-P	Pear	Comice	N/A	Historic	Preserve
LY-47-P	Pear	Comice	N/A	Historic	Preserve
LY-50-P	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
LY-53-P	Pear	N/A	Rootstock	Non Historic	May be Removed

These trees would have had a Comice scion during the historic period. Rootstocks in their original locations may have the potential to be grafted with the scionwood of Comice variety, to create variety replacement trees in their original locations. Some of the eight rootstock sprout trees are located between the rows and columns of trees, however, i.e., not in a historic location, due to underground suckering. These trees are incompatible with the character of the orchard, and should be removed. Overall, the Lydston Orchard is an excellent example of an early 20th century Comice pear orchard.



- PEAR (variety Comice)
- PEAR (rootstock sprout Quince)
- # CAMP BLOCKS
- FB FIRE BREAK
- North

LYDSTON ORCHARD
EXISTING CONDITIONS 2010

Wilder Orchard

The Wilder Orchard encompasses 3.75 acres and has a total of 64 trees: 38 historic and 26 non-historic. The Wilder Orchard is located in portions of residential Blocks 28 and 29 and in the adjacent firebreak south of Merritt Park on the northwest side of the camp. The orchard is punctuated by 7th and F Streets. In contrast to the Lydston Orchard, the Wilder Orchard was historically a predominantly Bartlett pear orchard. Of the 64 extant fruit trees, 29 are Bartlett variety pear trees and just seven are Comice variety pear trees. These are historic trees that date to the Manzanar Town Era in the 1910s. Three additional historic trees have combined rootstock sprout and scionwood in the canopy of the trees. In each of these trees, the scion part is Bartlett variety and is historic. The rootstock sprout part of the canopy is quince seedling (rootstock tissue) and is non-historic. The non-historic part of the canopy may be removed in the future. The historic tree spacing of the Wilder Orchard is still evident: 15 by 30-foot in 11 rows of fruit trees oriented east to west.

In addition to the historic trees, 25 rootstock sprout trees are present in the orchard. Of these, 23 are quince seedling and 2 are derived from the Winter Nellis pear variety. The aerial part of the rootstock sprout trees post-date the camp period and are non-historic. Some of the rootstock sprout trees are in the original tree locations, and these may be grafted with Bartlett scionwood to create variety replacement trees in the future. While these trees are identified as non-historic, they have some interpretive value for the visitor experience in reinforcing the orchard grid. Other rootstock sprout trees occur in non-historic locations (i.e.,

between the rows or columns of trees). These are incompatible with the historic character of the Wilder Orchard and should be removed. The Wilder Orchard is the largest extant orchard associated with the Manzanar Town Era and is important as an excellent example of a 20th century Bartlett pear orchard.

Wilder Orchard Existing Conditions					
Tree No.	Species	Variety	Other	Historic/ Non Historic	Tree Management
6F-1-3	Pear	Bartlett	N/A	Historic	Preserve
6F-1-4	Pear	Bartlett	N/A	Historic	Preserve
6F-1-5	Pear	Bartlett	N/A	Historic	Preserve
6F-1-6	Pear	Bartlett	N/A	Historic	Preserve
6F-1-7	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
6F-1-8	Pear	Bartlett	N/A	Historic	Preserve
6F-1-9	Pear	Bartlett	N/A	Historic	Preserve
6F-1-10	Pear	Bartlett	Combined	Historic	Preserve
6F-1-11	Pear	Bartlett	N/A	Historic	Preserve
6F-1-12	Pear	Bartlett	N/A	Historic	Preserve
6F-1-13	Pear	Bartlett	N/A	Historic	Preserve
6F-1-15	Pear	Bartlett	N/A	Historic	Preserve
6F-1-16	Pear	Bartlett	N/A	Historic	Preserve
6F-1-17	Pear	Bartlett	N/A	Historic	Preserve
6F-1-18	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
6F-1-19	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
6F-1-20	Pear	Bartlett	N/A	Historic	Preserve
6F-1-21	Pear	N/A	Rootstock	Non Historic	May be Removed
6F-1-22	Pear	Bartlett	N/A	Historic	Preserve

Wilder (contd) Tree No.	Species	Variety	Other	Historic/ Non Historic	Tree Management
6F-1-23	Pear	Bartlett	N/A	Historic	Preserve
6F-1-24	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
6F-1-25	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
6F-1-26	Pear	Bartlett	N/A	Historic	Preserve
6F-1-27	Pear	Bartlett	N/A	Historic	Preserve
6F-1-28	Pear	Bartlett	N/A	Historic	Preserve
6F-1-29	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
6F-1-30	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
6F-1-31	Pear	Bartlett	N/A	Historic	Preserve
6F-1-32	Pear	Bartlett	N/A	Historic	Preserve
6F-1-33	Pear	Bartlett	N/A	Historic	Preserve
6F-1-34	Pear	Bartlett	N/A	Historic	Preserve
6F-1-35	Pear	Bartlett	N/A	Historic	Preserve
6F-1-36	Pear	Bartlett	N/A	Historic	Preserve
6F-1-38	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
6F-1-39	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
6F-1-41	Pear	Bartlett	N/A	Historic	Preserve
6F-1-43	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
6F-1-44	Pear	Bartlett	N/A	Historic	Preserve
6F-1-45	Pear	Bartlett	N/A	Historic	Preserve
6F-1-46	Pear	Bartlett	N/A	Historic	Preserve
6F-1-48	Pear	Bartlett	N/A	Historic	Preserve
6F-1-49	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
6F-1-51	Pear	Bartlett	N/A	Historic	Preserve
6F-1-52	Pear	Bartlett	N/A	Historic	Preserve
6F-1-53	Pear	Comice	N/A	Historic	Preserve

Wilder (contd) Tree No.	Species	Variety	Other	Historic/ Non Historic	Tree Management
B28-1-1	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
B28-1-2	Pear	Comice	N/A	Historic	Preserve
B28-1-3	Pear	N/A	Rootstock	Non Historic	Should be replaced with Comice tree
B28-1-4	Pear	Comice	N/A	Historic	Preserve
B29-1-1	Pear	Comice	Combined	Historic	Preserve
B29-1-2	Pear	Comice	Combined	Historic	Preserve
B29-1-3	Pear	Comice	Combined	Historic	Preserve
B29-1-4	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
B29-1-5	Pear	Comice	N/A	Historic	Preserve
B29-1-7	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
B29-1-8	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
B29-1-9	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
B29-1-10	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
B29-1-11	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
B29-1-12	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
B29-1-13	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
B29-1-15	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
B29-1-16	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree
B29-1-17	Pear	N/A	Rootstock	Non Historic	Should be replaced with Bartlett tree

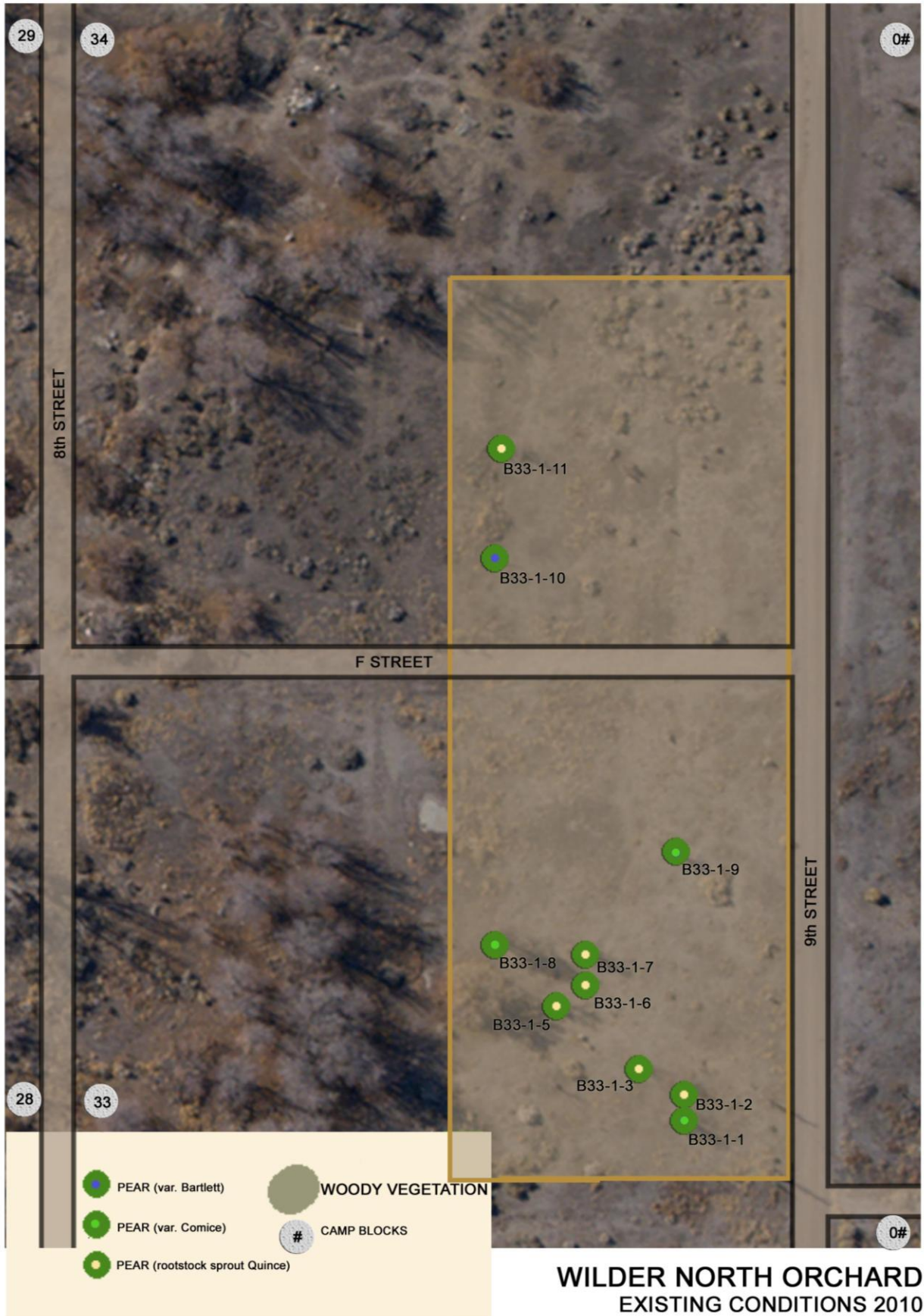


Wilder North Orchard

The Wilder North Orchard encompasses 1.88 acres and is composed of 10 trees: 4 historic and 6 non-historic. The Wilder North Orchard is located in the western portion of residential Block 33, and in the eastern portion of Block 34, which was reserved for Merritt Park and the orchard during the War Relocation Center Period. Of the 10 remaining fruit trees, one is a Bartlett variety pear tree and three are Comice variety pear trees that date to the Manzanar Town Era. Originally, the Wilder North Orchard was part of the Wilder Orchard, having been divided up during the development of the War Relocation Center. Six rootstock sprout trees (quince seedling) are present in the Wilder North Orchard, and these are non-historic. The aerial parts of the rootstock sprout trees post-date the camp period. The rootstock tissue may be used for propagation of replacement trees in the future, or these trees may be removed and replaced with either Bartlett or Comice variety trees.

Note: the Treatment Plan recommends the rehabilitation of the orchard area in Block 34 with apple, rather than pear trees. See the “Treatment Plan” for more information. Today, the Wilder North Orchard original tree spacing is no longer clearly evident. In historic aerial photographs, the tree spacing is evident as 15 by 30 feet spacing, consistent with the historic spacing of the Wilder Orchard. (It should be also noted that the Wilder North Orchard is misidentified as the “Hatfield” or the “Hatfield West” Orchard in the Cultural Landscape Report.)

Wilder North Orchard Existing Conditions					
Tree No.	Species	Variety	Other	Historic/ Non Historic	Tree Management
B33-1-1	Pear	Comice	N/A	Historic	Preserve
B33-1-2	Pear	N/A	Rootstock	Non Historic	May be Removed
B33-1-3	Pear	N/A	Rootstock	Non Historic	May be Removed
B33-1-5	Pear	N/A	Rootstock	Non Historic	May be Removed
B33-1-6	Pear	N/A	Rootstock	Non Historic	May be Removed
B33-1-7	Pear	N/A	Rootstock	Non Historic	May be Removed
B33-1-8	Pear	Comice	N/A	Historic	Preserve
B33-1-9	Pear	Comice	N/A	Historic	Preserve
B33-1-10	Pear	Bartlett	N/A	Historic	Preserve
B33-1-11	Pear	N/A	Rootstock	Non Historic	May be Removed



Descriptions of Outlying Fruit Trees

There are 25 outlying fruit trees throughout Manzanar NHS in areas not historically associated with the orchards of the War Relocation Center Period. Some of the outlying fruit trees date to the Manzanar Town Era and are historic, while others have developed since the historic period from rootstock sprouts or seeds, and are non-historic. Five species are represented in the outlying fruit trees: apricot, Asian pear, European pear, fig and peach. The locations of the outlying trees are depicted on the following site plans.

Hatfield Orchard Remnant: European and Asian Pears

The Hatfield Orchard Remnant has the largest concentration of outlying trees, namely 11 trees. None of the trees are historic. The trees are located at the east boundary of the camp, near A and 5th Streets. The site of the Hatfield Orchard is associated with the Manzanar Town Era, when the land was planted in orchards by the Hatfield family. Historic aerial photographs from the time of the War Relocation Center indicate that the area had been cleared of orchards. During the camp period, this location was maintained in low vegetation as part of the firebreak at the eastern boundary.

The Hatfield Orchard Remnant is composed of 11 rootstock sprout trees, all having developed as trees since the period of significance. The rootstocks of some of these trees may date to the Hatfield's ownership



North

OUTLYING FRUIT TREE AREAS EXISTING CONDITIONS 2010

during the Manzanar Town Era; however, they possibly managed to survive the camp period as roots and suckers. No orchard existed in this location during the camp period, however, and so all of these trees may be removed to accurately depict the camp period. However, the park may choose to gradually reduce and terminate maintenance over time.

Out of the 11 rootstock sprout trees, 10 are quince seedlings and one is the seedling rootstock of an Asian or “Sand” pear, *Pyrus pyrifolia*. It is likely that this rootstock was grafted with an Asian hybrid pear variety during the Manzanar Town Era, such as “Kieffer”. The Kieffer variety was bred in 1873 the United States, a result of crossing two species, the Asian pear, *P. pyrifolia* and the European pear, *P. communis*. The Asian pear is shaped more like an apple, with a yellow or russeted skin. The fruit has a crisp and granular texture, with a low-acid watery sweet taste. American horticulturists hybridized Asian and European pears to attempt to blend the preferred characteristics of the two species: the succulence and melting flavor of the European pear, with the heat, drought and blight resistance of the Asian pear. By the early 1900s, the Kieffer had become the most widely planted pear in orchards of the Southern states, due to its adaptation to high heat.



Figure 15: Watercolor painting of an Asian pear (USDA Pomological Watercolor Collection).



Figure 16: Asian pear tree in the Hatfield Orchard Remnant (PWRO, 2010).

The CLR suggests that internees may have grafted Asian pear scionwood onto fruit trees during the camp period, though further research is needed to verify this information.⁶ While none of the Hatfield Orchard Remnant fruit trees are recommended to be preserved in place in the future, the Asian pear rootstock tissue or germplasm should be conserved as it is associated with the history of the landscape. The Asian pear may be used for rootstock tissue to graft either Asian pear varieties or Asian hybrid pear varieties in the future. The planting of an Asian pear tree is most recommended to replace a dead or dying tree in the residential block areas, rather than in one of the four main orchards, as it

⁶ Cultural Landscape Report: Manzanar National Historic Site, 153.

is most likely that internees would have modified the trees in the block areas by re-grafting, rather than in the orchards.

Hatfield Orchard Remnant Existing Conditions					
Tree No.	Species	Variety	Other	Historic /Non Historic	Tree Management
P13-1-1	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-2	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-3	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-4	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-5	Asian Pear	N/A	Rootstock	Non Historic	May be removed, but germplasm should be conserved
P13-1-6	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-7	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-8	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-9	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-10	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-11	Pear	N/A	Rootstock	Non Historic	May be removed

Block 12: Fig

Residential Block 12 contains three outlying fruit trees that are identified as fig trees. Fig trees are multi-trunked trees, whose trunks are removed periodically by pruning to stimulate wood renewal and heavier fruit

production. In addition, the trunks may freeze in winter and die back to the roots. In both cases, trunks regenerate as new basal shoots from the rootstock. While the trunks of the fig trees in Block 12 do not date to the War Relocation Center Period, the rootstocks could possibly date to this time. There are no records of figs being grown commercially in the town of Manzanar, but it is possible that these trees may have been planted by internees from seeds or cuttings.⁷ Fig trees can be readily reproduced by vegetative propagation. The park’s fig trees are of unknown variety, but these bear two crops of fruit per year, one in spring and fall. In 2010, two of the fig trees are in good condition, and the other one, having been affected by an encroaching Tamarisk tree, is in fair condition.

Block 12 Fruit Trees Existing Conditions					
Tree No.	Species	Variety	Other	Historic/ Non Historic	Tree Management
B12-1-1	Fig	Unknown	N/A	Historic	Preserve
B12-1-2	Fig	Unknown	N/A	Historic	Preserve
B12-1-3	Fig	Unknown	N/A	Historic	Preserve

Victory Garden near Block 12: Apricot

A young apricot tree is located beside the former Victory Garden area near Block 12. The tree is an ungrafted seedling tree, possibly derived from the seed of apricot trees once grown in the Victory Garden or in the vicinity. The tree appears to be less than 20 years old. While not historic,

⁷ Cultural Landscape Report: Manzanar National Historic Site, 149-154.

the tree has the potential to provide more information about the Manzanar Town Era or the War Relocation Center Period in the future. Apricot trees were grown in the area during the Manzanar Town Era. The germplasm of the tree should be preserved.

Victory Garden Fruit Tree Near Block 12, Existing Conditions					
Tree No.	Species	Variety	Other	Historic/ Non Historic	Tree Management
B12-1-4	Apricot	N/A	Rootstock	Non Historic	May be removed, but germplasm should be conserved

Block 28: Pear

Two pear trees are located northeast of the Wilder Orchard in residential Block 28 near 7th and F Streets. These trees were part of the Wilder ownership parcel in the Manzanar Town Era, and were probably part of the Wilder Orchard at that time. By the War Relocation Center Period, these trees were separated from the Wilder Orchard and integrated into a residential block. Both trees in Block 28 are pear trees. One tree, a Comice variety pear is historic, while the other is a pear rootstock sprout (a quince seedling) that has developed since the historic period. This tree is non-historic. Both trees were probably Comice variety during the War Relocation Center Period. The Comice tree should be preserved. The rootstock sprout tree may be removed, or used for rootstock tissue in the propagation of replacement pear trees for other areas.

Block 28 Fruit Trees Existing Conditions					
Tree No.	Species	Variety	Other	Historic/ Non Historic	Tree Management
B28-1-5	Pear	Comice	N/A	Historic	Preserve
B28-1-6	Pear	N/A	Rootstock	Non Historic	May be removed

Block 22: Pear

One pear tree is located in residential Block 22 near 6th and F Street. This tree is a rootstock sprout (a quince seedling) and is non-historic. The rootstock may date to the Manzanar Town Era, when the site of Block 22 was owned by the Owens Valley Improvement Company (OVIC). This rootstock sprout tree may be removed, or used for rootstock tissue in the propagation of replacement pear trees for other areas.

Block 22 Fruit Tree Existing Conditions					
Tree No.	Species	Variety	Other	Historic/ Non Historic	Tree Management
B22-1-1	Pear	N/A	Rootstock	Non Historic	May be removed

Children’s Village: Pear

Two outlying pear trees are located in the general vicinity of Children’s Village. Both trees are sited on land once owned by the Wilder family during the Manzanar Town Period, and these trees were probably once incorporated within the Wilder Orchard. By the time of the War Relocation Center, the trees had been separated from the Wilder Orchard. One tree is a Bartlett variety pear, and is historic. The other tree is a rootstock sprout and is non-historic. Both trees were probably Bartlett variety during the camp period. The Bartlett tree should be preserved. The rootstock sprout tree may be removed, or used for rootstock tissue in the propagation of replacement pear trees for other areas.

Children’s Village Fruit Trees Existing Conditions					
Tree No.	Species	Variety	Other	Historic/ Non Historic	Tree Management
CV-1-1	Pear	Bartlett	N/A	Historic	Preserve
6F-1-54	Pear	N/A	Rootstock	Non Historic	May be removed

Block 29: Peach

Two peach trees are located within residential Block 29. These trees are probably rootstock sprouts, having regenerated from the rootstock of older trees. While these trees are non-historic, their roots may date from the War Relocation Center Period, when internees may have started these trees from seed. Peach trees can be readily propagated from seed, after a period of winter chilling. In contrast to other seedling orchard fruits, seedling peaches are generally good to eat raw, and so non-variety trees would have been valuable for fruit as well as ornamental in blossom. Other seedling fruits generally need to be cooked to become edible. The Block 29 peach trees have wild vigor, and will become mature trees, with adequate browse protection. These trees provide more information about the camp period, and should be preserved.

Block 29 Fruit Trees Existing Conditions					
Tree No.	Species	Variety	Other	Historic/ Non Historic	Tree Management
B29-1-1	Peach	N/A	Rootstock	Non Historic	Preserve
B29-1-2	Peach	N/A	Rootstock	Non Historic	Preserve

Hospital Complex: Pear

One pear tree is located in the Hospital Complex near 7th and H Streets. This tree is a rootstock sprout (a quince seedling) and is non-historic. The rootstock may date to the Manzanar Town Era, when the site of the Hospital Complex was owned by the Owens Valley Improvement Company. This rootstock sprout tree may be removed, or used for rootstock tissue in the propagation of replacement pear trees for other areas.

Hospital Complex Fruit Tree Existing Conditions					
Tree No.	Species	Variety	Other	Historic/ Non Historic	Tree Management
HC-1-1	Pear	N/A	Rootstock	Non Historic	May be removed



Figure 17: Remnant pear tree with two rootstock sprouts in the Hospital Complex (PWRO, 2010)

Block 14: Peach

Two peach trees are located within residential Block 14. Like the peach trees of Block 29, these trees are probably rootstock sprouts, having regenerated from the rootstock of older trees. While these trees are non-historic, their roots may date from the War Relocation Center Period,

when internees may have started these trees from seed. The Block 14 peach trees have wild vigor, and will become mature trees, with adequate browse protection. These trees provide more information about the camp period, and should be preserved.

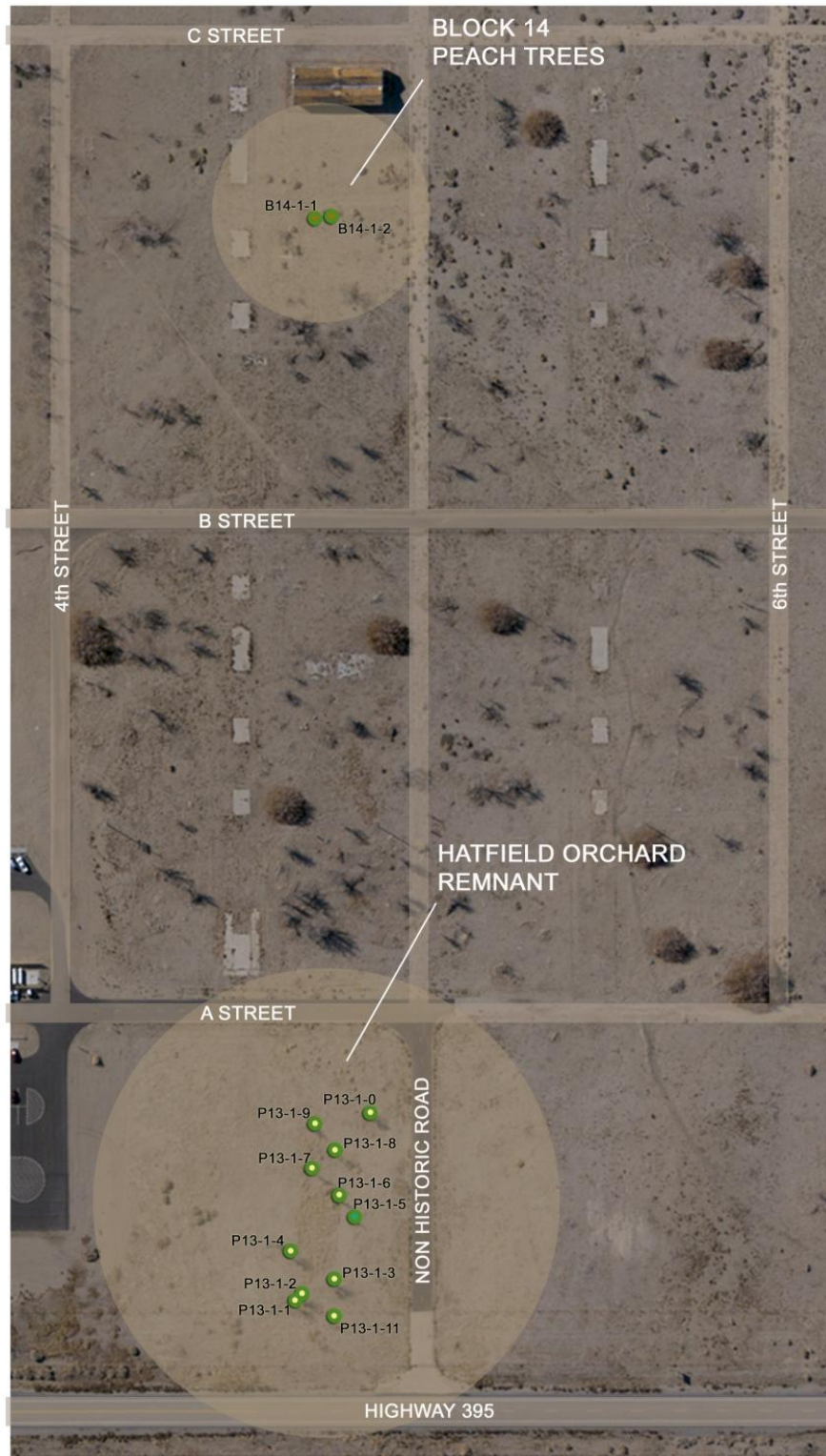


Figure 18: Historic photo of a peach tree located at the corner of a barracks in a residential block, where it was probably grown from seed by an internee (Miyatake #57, Manzanar NHS Archives).

Block 14 Fruit Trees Existing Conditions					
Tree No.	Species	Variety	Other	Historic/ Non Historic	Tree Management
B14-1-1	Peach	N/A	Rootstock	Non Historic	Preserve
B14-1-2	Peach	N/A	Rootstock	Non Historic	Preserve



Figure 19: Contemporary photo of a rootstock peach tree located in residential Block 14 (PWRO, 2010).



-  ASIAN PEAR (Sand Pear)
-  PEAR (rootstock sprout Quince)
-  PEACH (seedling)


North

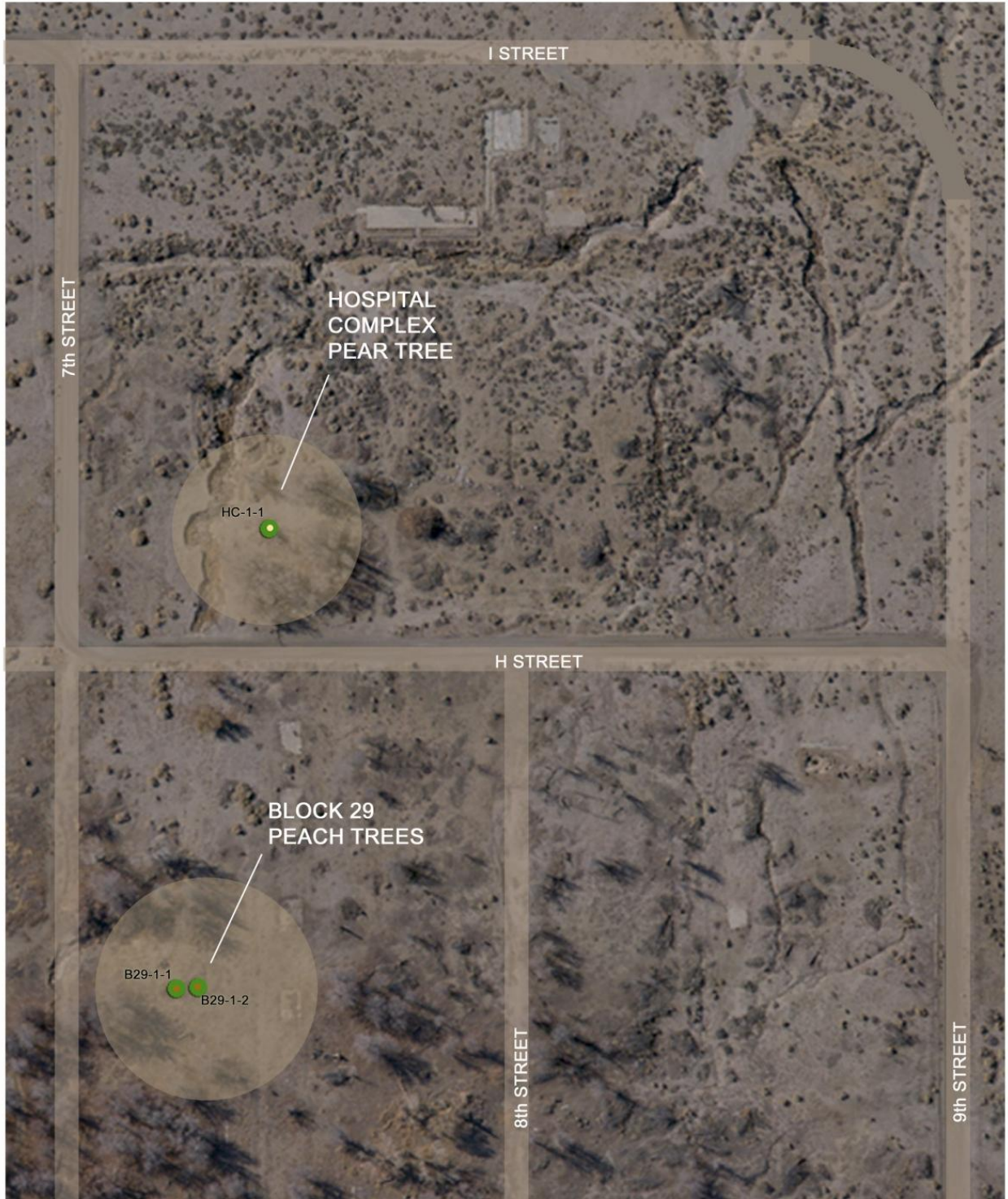
OUTLYING TREES: BLOCK 14 AND HATFIELD ORCHARD REMNANT

EXISTING CONDITIONS 2010





**OUTLYING FRUIT TREES: BLOCKS 22, 28, 29
AND CHILDREN'S VILLAGE
EXISTING CONDITIONS 2010**



- PEAR (rootstock sprout Quince)
- PEACH (seedling)



North

**OUTLYING TREES: HOSPITAL COMPLEX
AND BLOCK 29**
EXISTING CONDITIONS 2010

2010 Summary Table of Fruit Tree Quantities and Types						
Orchard Name	Location	Species	Variety	No. Variety Trees (Living)	No. Rootstock Sprout Trees (Living)	Total No. Trees
Lafon	Block 5	Apple	Unknown	1	0	5
	Block 11	Apple	N/A (seedling)	0	1 (seedling apple rootstock)	
		European Pear	Comice	2	1 (quince rootstock)	
Lydston	North of Block 23 (Firebreak)	European Pear	Comice	16 (includes 3 combined tree – scion and rootstock sprout)	8	24
Wilder	North of Block 23 (Firebreak)	European Pear	Bartlett	32 (includes 1 combined tree – scion and rootstock sprout)	11 (quince rootstock) 1 (Winter Nellis rootstock)	64
		European Pear	Comice	1		
	Block 29	European Pear	Comice	4 (includes 3 combined trees – scion and rootstock sprout)	10 (quince rootstock) 1 (Winter Nellis rootstock)	
	Block 28	European Pear	Comice	2	2 (quince rootstock)	
Wilder North	Block 34	European Pear	Bartlett	1	1 (quince rootstock)	10
	Block 33	European Pear	Bartlett	2	5 (quince rootstock)	
		European Pear	Comice	1		
Outlying fruit trees	Block 12	Fig	Unknown	3	0	4

Outlying fruit trees (contd.)		Apricot	N/A (seedling)	0	1 (seedling apricot)	
	Block 14	Peach	N/A (rootstock sprout)	0	2 (seedling peach rootstock)	2
	Block 22	European Pear	N/A (rootstock sprout)	0	1 (quince rootstock)	1
	Block 28	European Pear	Comice	1	1 (quince rootstock)	2
	Block 29	Peach	N/A (rootstock sprout)	0	2 (seedling peach rootstock)	2
	Children's Village (Firebreak)	European Pear	Bartlett	1	1 (quince rootstock)	2
	Hospital Complex	European Pear	N/A (rootstock sprout)	0	1 (quince rootstock)	1
	Hatfield Orchard Remnant (Firebreak)	Asian Pear	N/A (rootstock sprout)	0	1 (Asian pear rootstock)	11
European Pear		N/A (rootstock sprout)	0	10 (quince rootstock)		

ORCHARD MANAGEMENT

Preservation Maintenance Activities

Propagation

The goal of propagation is to create new or replacement trees for the park's historic orchards, using the existing historic fruit trees as source material (germplasm) to the greatest extent possible. Vegetative propagation is a method of genetic cloning, and is therefore a way to conserve historic germplasm over time. It is important to conserve historic germplasm through custom-propagation efforts rather than by purchasing "ready-made" fruit trees from a vendor, to preserve the historic integrity of the park's cultural landscape. While the varieties of the historic fruit trees at Manzanar NHS are not rare, these varieties have been altered through horticultural breeding by the industry since the early 20th-century. Many strains or altered versions of varieties have been created over time, to improve the commercial characteristics of the original variety. To some extent, the more common varieties such as Bartlett and Comice pear have been altered most through the creation of strains. Propagation by taking cuttings from the historic trees preserves the significance and integrity of the park's historic orchards, through germplasm conservation.

An important concept in propagating fruit trees is the concept of grafting. Grafting joins two different trees together, one part forms the roots, the rootstock, and the other part forms the trunk and canopy, known as the scion. Grafting is performed because the variety (scion) is generally reluctant to form its own roots. Only the scion carries the genes of the cultivated variety, such as Bartlett pear or Winesap apple and must be vegetatively propagated using cuttings, rather than seeds. During the time of the Manzanar Town Era and Relocation Center Period, all of the variety trees were grafted onto seedling rootstocks. After World War II, orchard horticulture in the United States transitioned to the use of dwarfing rootstocks for grafting fruit trees. Seedling rootstocks, i.e., using the roots of a plant originated from a seed is the historically accurate rootstock type for Manzanar NHS fruit trees.

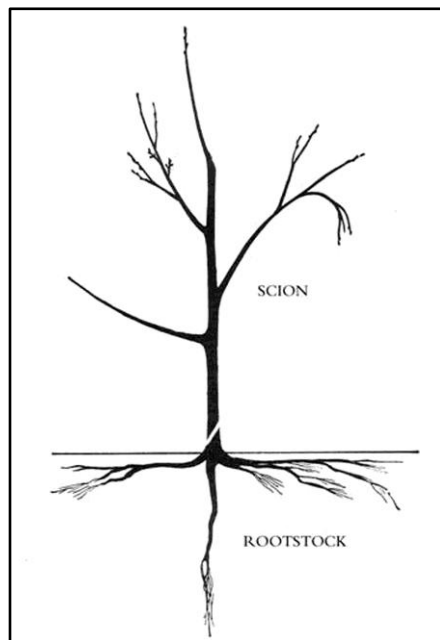


Figure 24: Diagram of scion/rootstock of a grafted fruit tree (adapted from The Pruning Manual by E.P. Christopher, The Macmillan Company, New York, 1957).

If germplasm is not available for propagation from historic trees within the park for a particular variety, several sources can be used to obtain appropriate germplasm. The National Plant Germplasm Repository (NPGR) system has the largest historic fruit and nut variety germplasm collection in the nation, and is the preferred source. The NPGR in Geneva, New York is a source for historic apple variety germplasm and the NPGR in Corvallis, Oregon is a source for historic pear variety germplasm. An agreement can be developed with the NPGR for propagation services, using germplasm from the Repository. Alternatively, a qualified commercial nursery vendor can provide custom-propagation services for replacement trees. Typically, these services can be provided as a simplified purchase.

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

- The desired number of propagated trees - specify up to 30% extra to allow for some mortality after planting;
- The scion variety (scion cuttings can be provided by the park or derived from NPGR);
- The type of rootstock – in all cases, the type needed for the Manzanar NHS cultural landscape will be *seedling* rootstock (e.g., seedling apple and seedling pear, and not clonal dwarfing rootstock);
- The height of the graft union – this should be specified as “low”, so that when the tree is planted, the graft union will be just above the ground, depicting historic conditions;

- Desired length of cultivation – specified as a minimum of one and a maximum of two years. The specified delivery date should be as close to the time of planting as possible.

Propagated trees can be provided in six-inch to one gallon-sized containers, as bareroot trees in February, or balled and burlapped (B&B). Propagated trees can be ready for delivery in one year, or may be held for two years before delivery and planting. New containerized trees to be held for two years should be potted in one gallon minimum-sized containers. After delivery, young trees should be kept well-watered until planting.



Figure 25: Contemporary photo of a Manzanar pear tree displaying a distinct graft union near the ground level (PWRO, 2010).

Planting New and Replacement Trees

Appropriately-propagated fruit trees should be planted during the dormant season, between late fall and early spring. At the time of planting, the soil should not be frozen or waterlogged, but be workable with a shovel. New tree locations should be marked prior to planting, either with a stake or vegetable-based paint sprayed on the ground. Archeological testing of new tree locations should be performed prior to soil disturbance.

For large plantings (such as those recommended in the treatment plans for the Lydston, Wilder and Wilder North Orchards), hole digging can be expedited using a mechanical soil auger. For smaller scale plantings, holes can be dug by hand shovel. Holes should be at least one and-a-half times to three times the size of the tree root system, to ensure that roots can be spread out in the hole, without bending or “jay rooting”. The hole should be just deep enough to accommodate the whole root system, but not cover the tree trunk with any more soil than it was already covered in the container. The graft union should be positioned just above the level of the soil, in order to prevent the scion (aerial parts above the union) from rooting.

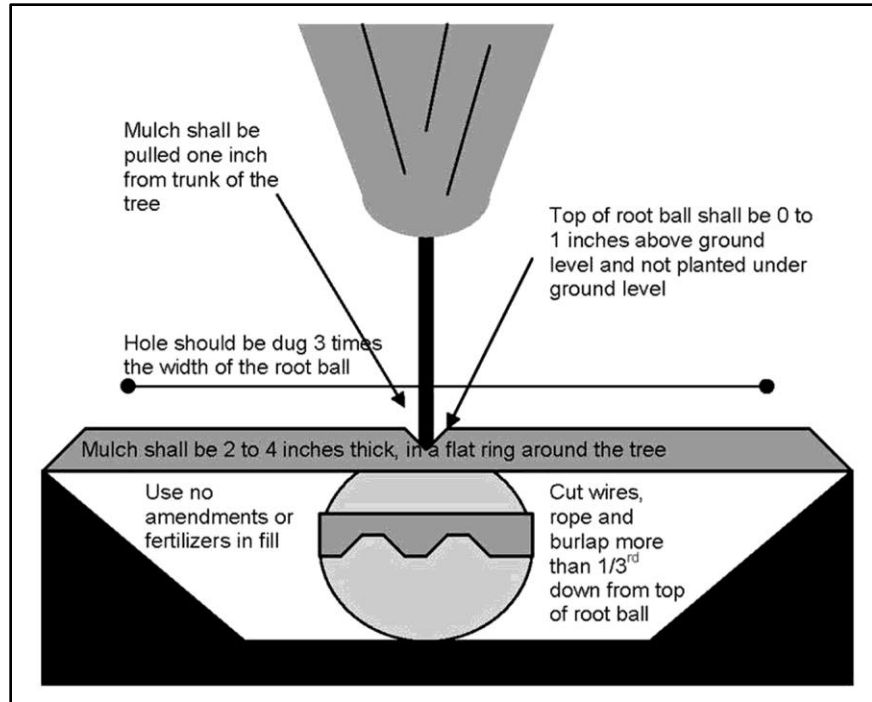


Figure 26: Diagram showing correct planting method of a balled and burlapped tree with mulching. The same guidelines apply the planting of containerized trees (City of Evansville Department of Urban Forestry, 2001).

When planting new fruit trees, broken roots should be removed using a sterilized knife. Roots should be spread out in the hole, and backfilled with conserved topsoil. After filling the hole, the soil should be lightly tamped, and a low, soil berm hand-formed around the perimeter of the planting hole, to create a shallow watering basin around the tree. All branches within 16 inches of the ground should be removed using pruning shears. A two-inch deep layer of nutritional mulch should be spread around the tree, up to eight feet in diameter, or a minimum of three feet in diameter, in order to eliminate competing vegetation, retard evaporation, and discourage rodents. Mulch should not touch the tree

trunk (see “Mulching” for more information). Trees should be thoroughly watered at planting, and then be given a minimum of one inch-depth of water per week through the dry seasons.

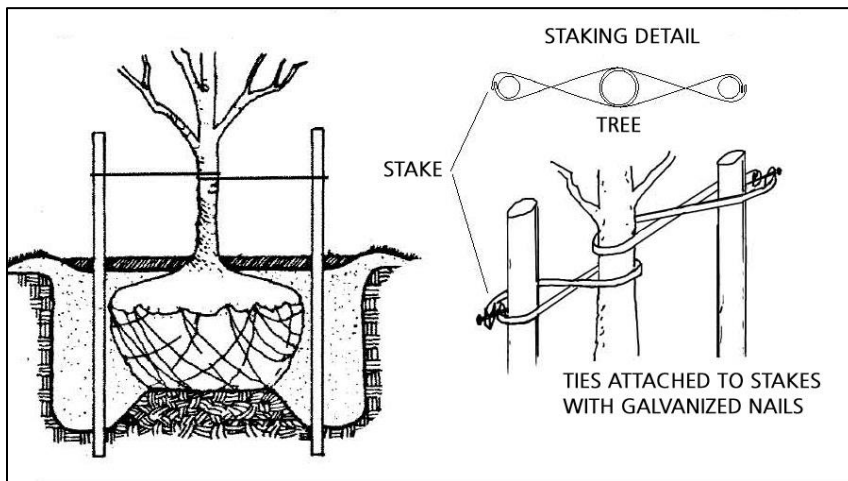


Figure 27: Diagram of tree staking method (adapted from Deep Root Partners, L.P. 2002).

At planting, trees should be double-staked, to protect them against wind-throw. Six-foot tall tree stakes should be driven at least one foot into the ground and one stake should be located on either the windward or leeward side of the tree. Loosely installed rubberized tree ties are the preferred material for securing the trees to the stakes. Tree stakes should be maintained for up to two years after planting, and then removed. Failure to remove the tree stakes will prevent natural swaying motion that promotes thickening of tree trunks, and will result in structurally weak trees.

Sun Scald Protection

All new fruit trees should receive sun scald protection immediately after planting. Sun scald is a serious health stressor and a major cause of young fruit tree mortality. The trunks of young fruit trees should be protected by painting with a contemporary white-wash. An acceptable white wash is a 50% solution of white latex paint in water. The full height of exposure of the trunk should be painted in preferably cool (less than 70 degrees Fahrenheit) and dry weather conditions. Over time, the white wash will be degraded by ultraviolet light, and should be re-applied during appropriate weather conditions to maintain an opaque coat. Sun scald protection should be provided until the fruit tree has developed mature bark (a minimum of five years).



Figure 28: Image of young apple trees with white washed trunks for sun scald protection (Rich Collins, 2008).

Various commercial fabrics for sun scald protection are also available. These products are wrapped around the trunk and must be loosened as the tree grows to avoid retarding development. Whitewash is the recommended historically compatible method of protection, however, and is the more flexible and easily maintained over time.

Pruning

Pruning is a skilled activity that should be performed by trained staff. International Society of Arborists (ISA) Certification, is the preferred qualification for park staff involved in tree pruning. The NPS “Arborist Training Program” is an in-house 18-month long program that results in an International Society of Arborists (ISA) Certification.

Annual pruning of the park’s fruit trees is needed to perpetuate their historic character and promote the health and longevity of the trees. During the Manzanar Town Era and Relocation Center Period, annual pruning of the fruit trees was an accepted horticultural practice. Pruning was used to create a productive framework or scaffold of branches, to stimulate fruit wood production, to remove diseased wood, to thin fruit, and to manage the size of each tree. While the same objectives apply today, it is important to use the *low-headed scaffold* and *open bowl form* used in the historic period, rather than contemporary standards for tree form. The low-headed, open-bowl scaffold is developed in the young tree during the first several years after planting. More details are provided under “Pruning Young Trees”.



Figure 29: Historic photograph of internees pruning neglected fruit trees at Manzanar using loppers and a tree saw (Bancroft Library, University of California, Berkeley).

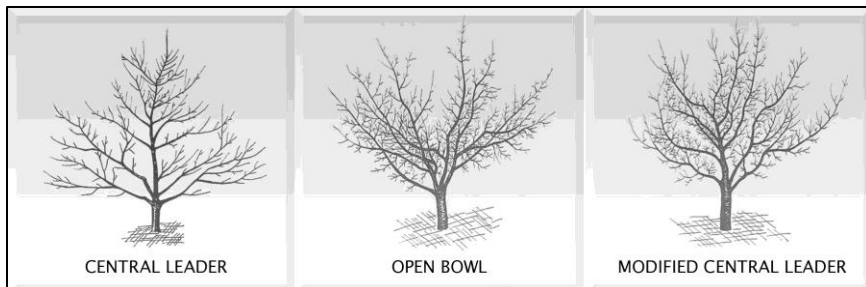


Figure 30: Diagram of pruning styles typical of the early 20th-century during the Manzanar Town Era and the War Relocation Center Period. The “open bowl” style was used in the extant historic fruit trees of Manzanar NHS.

Pruning is performed in winter, and typically between January and March. It should be done after leaf fall and before bud break, except for pear and apricot trees, which may be pruned later in spring, to avoid *Cytosporina* infection or to remove Fireblight infection. More pruning details are provided under individual species. Root suckers or aerial water sprouts may be removed in summer or winter. Dead or diseased wood can be removed at any time of year.

Hand shears can cut stems up to one half inch in diameter, and are useful for pruning young, non-bearing fruit trees. Loppers are needed to prune branches up to one inch in diameter. Pole loppers are useful for reaching up to one-inch branches at the top of tree canopies. A tree-pruning saw is required for cuts larger than one inch and up to three inches in diameter. A chainsaw, when skillfully used by a trained operator (such as a certified Arborist) can be used for cuts larger than 3 inches. An easily maneuvered tripod tree ladder is needed for saw cuts high in the canopy. A mechanical high-lift is more convenient than a ladder for large pruning jobs high in the canopy. The high-lift must be driven on site however,

and has the potential to disturb exposed archeological features. Use of a tree ladder rather than a high-lift is recommended within the camp block areas, to protect archeological features. Use of the high-lift is acceptable within the Lydston and Wilder Orchard areas.



Figure 31: Photos of a tree ladder (in a historic apricot orchard at Capitol Reef N.P.), (PWRO 2001).

All debris pruned from fruit trees should be removed from the site to avoid disease transmission. Debris may be disposed of as solid waste, be burned or chipped and composted to form nutritional mulch. However, complete composting is essential for the prevention of pest and disease transmission in mulch. Complete composting is achieved by wind-

rowing organic material to a maximum height of three feet, and seasonal turning of the material (a front-end loader can be used) to dissipate interior heat. (See “Mulching” for more information on the use of mulch.)

Pruning Young Trees: Scaffold Development

The main framework or “scaffold” of a fruit tree is developed during the dormant season, in the first several years after planting. The scaffold refers to the system of the trunk and main structural branches, and for the Manzanar NHS cultural landscape, the scaffold should be *low-headed* with an *open-bowl form*. The low-headed scaffold was the cultivated form of most fruit trees used in America between 1880 and 1945. The open-bowl pruning style was the style typically used in the area of the Manzanar Town Site, which would become the Manzanar War Relocation Center.

The region on the trunk where most of the main framework branches are borne is called the “head” of the tree. The “head” maintains its position as the tree grows, i.e., it does not extend higher as branches grow in diameter. The lower surface of each growing branch becomes lower to the ground as it expands, and the upper surface become further from the ground. However, the center of each branch remains at its original height relative to the trunk and ground level as when it was originally formed. A low-headed tree is created by cutting off the central leader (the main stem) of a young whip 30 inches from the ground immediately after planting. Three to five well-spaced lateral buds near the top end of the cut whip are allowed to grow out; however, no lateral bud should be

less than 24 inches above the ground. The three to five lateral buds should radiate around the trunk like the spokes of a wheel, and be at least two inches apart in height, in order to make room for the adequate spacing of five lateral branches. A maximum of three scaffold limbs are recommended for large species such as pear and apple, and up to five limbs are appropriate for smaller species such as peach and apricot.



Figure 32: Pear tree in the Wilder Orchard with an open-bowl form (PWRO, 2010).

Over the next two to three winters, a low-headed, open-bowl scaffold is formed by rubbing off excess lower buds on the trunk, and pruning off lateral branches growing towards the center. Eventually, the resultant scaffold will appear as an inverted umbrella of 18 to 30 inches in height with three to five spokes (lateral branches) oriented outwards. Once the

low head is established, the open bowl scaffold is retained and further developed by winter pruning of secondary and tertiary branches. Laterals growing into the open bowl are removed, and laterals growing to the outside are thinned for good spacing, to avoid shading of one branch by the one above. Laterals are also headed back to an outside bud to stimulate spreading of the scaffold when these buds grow out as shoots. All pruning cuts are made immediately outside of the collar or abscission zone of the branch, or immediately above a lateral bud, to avoid leaving a stub (known as the “Target Pruning Method”). More information on pruning cuts can be found in “Pruning Mature Trees.”

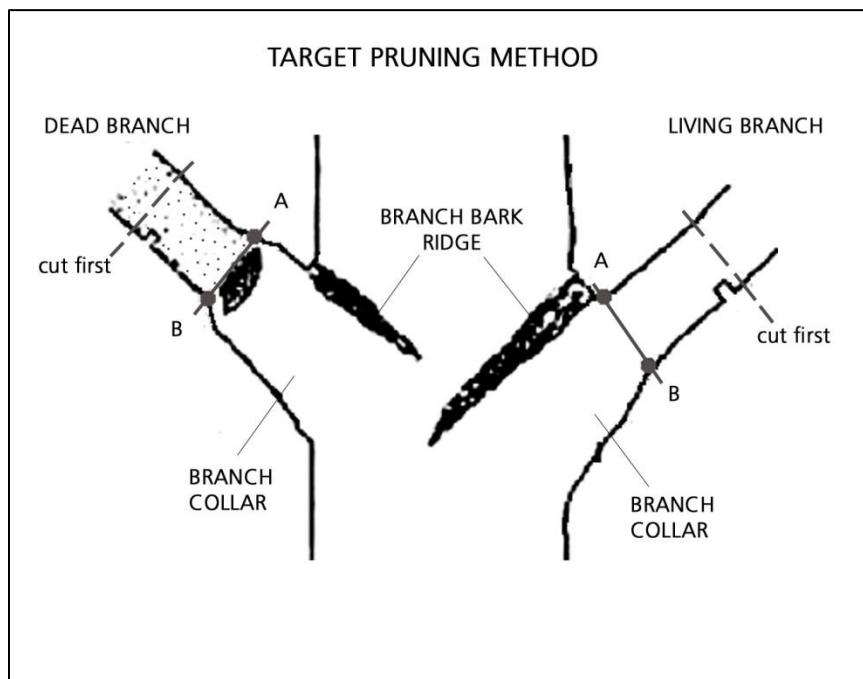


Figure 33: Diagram illustrating the target method of pruning. The line “A-B” is the correct location of the cut, immediately outside the branch collar (International Society of Arborists, 2006).

Pruning Mature Trees: Scaffold Maintenance

After initial scaffold development, winter pruning should be performed annually to maintain the tree scaffold. Without pruning, the historical form of the tree and character of the orchard will be lost. In addition to perpetuating the scaffold, winter pruning serves to remove dead and diseased wood, thin fruit-wood while stimulating new fruit-wood production, and to increase fruit quality by opening up the tree canopy to more light and air penetration.

Fruit trees that are annually pruned have a more balanced appearance than trees that are only pruned periodically. When winter pruning is performed annually, the hierarchy of branch sizes in each tree will vary gradually from the primary scaffold limbs to the secondary and tertiary lateral branches along a spectrum of diminishing size. This is the desirable condition. If annual pruning is not performed for a period of years and then resumed, the hierarchy of branching will be uneven, as large outer limbs are pruned and give rise to tiny, terminal branches. The undesirable appearance is of large, stubby limbs bearing wispy terminal branches. The need to remove large limbs due to a cessation in pruning opens up the upper canopy to a lot more sunlight, and can result in sun scald to the upper branches. Removal of large limbs also results in the growth of water sprouts or suckers; these are vertical, non-fruiting shoots that drain a tree's energy resources. Regular winter pruning avoids the need to remove large, over-grown limbs, and maintains a balanced branching hierarchy, with a sun-scald protective canopy.

To maintain an even-branching hierarchy as described above, winter pruning in mature trees is performed on the secondary and tertiary branches, and not on the primary scaffold branches (unless a scaffold branch is dead or diseased). A combination of two pruning methods is used to maintain the open-bowl form and a balanced canopy: heading back and thinning out. Heading back targets the secondary branches (those borne from the primary scaffold branches), whereas thinning out targets tertiary branches (those borne last, or from the secondary branches). As heading back removes secondary branches, it also removes the tertiary branches borne from those branches, and results in the reduction in the size of the canopy (rather like removing the fingers of a glove at the knuckles). Thinning out removes tertiary and younger branches, and results in the opening up of the tree canopy (rather like removing every-other finger on a glove). As a general rule, no more than 30% of a tree canopy should be removed in one winter pruning, and a mature fruit tree should not be headed back more than five feet. Annual winter pruning will avoid the need for large limb removal and severe canopy reduction.

Heading back and thinning out are performed in the dormant season to maintain a balanced open-bowl tree canopy, with outward spreading, well-spaced branches. Well-spaced branches do not cross, touch, closely parallel, or shade one another. A well-spaced canopy can be viewed from below, looking up into the canopy, and find no branches occupying the same vertical or horizontal location. Each secondary and tertiary branch has its own space. A spreading canopy is formed by heading back or shortening a branch to the point of an outside-oriented bud (rather than an inside bud). Each year, more thinning out is performed than heading back and the goal is generally to make many small cuts (i.e., thinning only

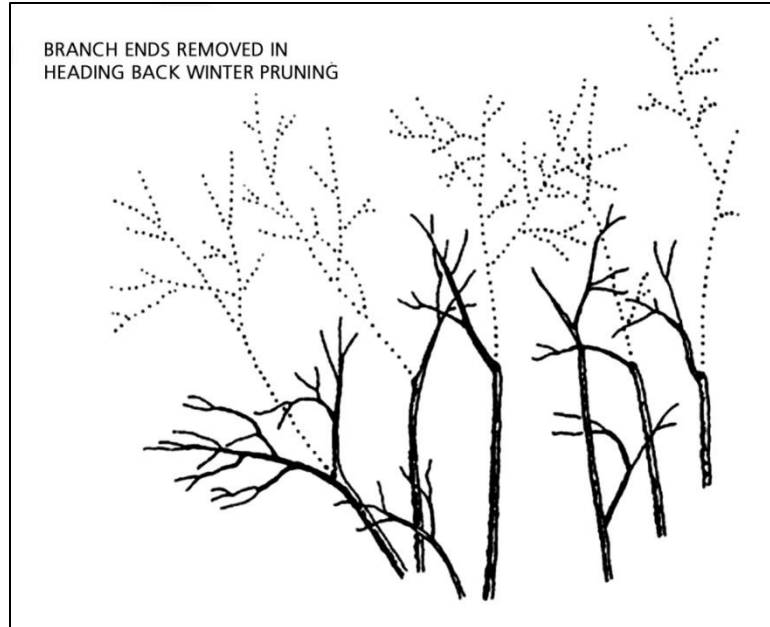


Figure 34: Diagram illustrating heading back or canopy reduction practices (International Society of Arborists, Best Management Practices, Tree Pruning, 2008).

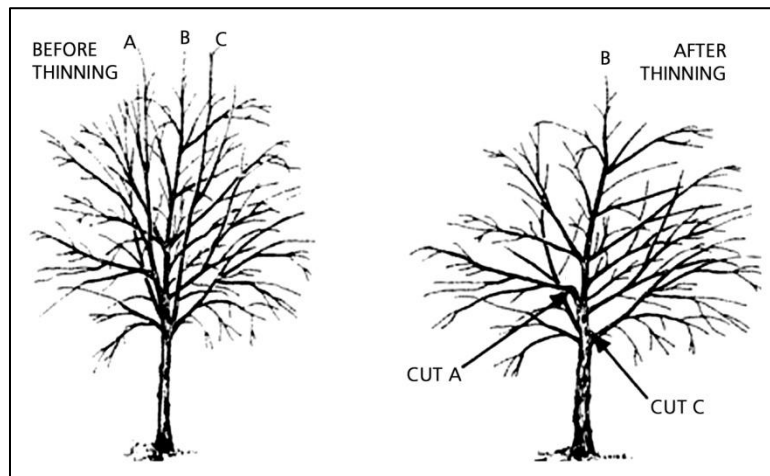


Figure 35: Diagram illustrating thinning pruning of large limbs in a central leader style tree (International Society of Arborists, Best Management Practices, Tree Pruning, 2008).

the small, new growth) equally over the entire canopy, to stimulate balanced growth.

Pruning Apple Trees

Upon implementation of the OMP Treatment Plan, old and young apple trees will exist in the Lafon Orchard, and young apple trees will exist in the Wilder North Rehabilitation Orchard.



Figure 36: Contemporary photo a Lafon Orchard historic apple tree (PWRO, 2010).

To prune apple trees, follow the general pruning guidance above for young and mature fruit trees. Apple trees bear blossoms and fruit on last year's or older wood, on short branches called spurs. At the time of winter pruning, the short spurs will be clearly evident along the tertiary branches. Removing tertiary branches to thin out the canopy will also remove fruit spurs. Fruit yield will be reduced by removing tertiary branches, or by removing individual fruit spurs along tertiary branches. Winter pruning is one form of fruit thinning that is desirable to prevent heavy bearing of apple trees. Heavy bearing is undesirable, as it taxes the energy resources of apple trees and can result in limb breakage due to heavy weight. Once formed, the same apple fruit spurs can continue to bear fruit for more than a decade.

After winter pruning, when dormancy breaks, blossom buds will open on the remaining fruit spurs. Shortly afterwards, vegetative buds will break along the tertiary branches, or at the tips of fruit spurs. These will grow out to form new shoots, approximately 10-20 inches long in young trees, and 6-10 inches long in healthy old trees. The new shoots will develop fruit spurs during the growing season. To maintain the size of the mature canopy, remove these new shoots from the last season's growth during winter pruning. For younger trees, new shoots can be partially headed back or thinned, to stimulate a fuller canopy with more fruit spurs. Water sprouts or root suckers should be removed in winter or summer.

Pruning Pear Trees

Upon implementation of the OMP Treatment Plan, old and young pear trees will exist in the Lydston and Wilder Orchard areas, and old pear trees will remain in the Wilder North and Lafon Orchards and in the Outlying Tree areas.



Figure 37: Contemporary photo of a Lydston Orchard historic pear tree (PWRO, 2010).

Generally less pruning is needed for pear trees than apple, as new growth is less prolific. However the Comice pear variety, found predominantly in the Lydston Orchard, is particularly prone to developing epicormic growth or water sprouts, and therefore needs more summer pruning as well as winter pruning. After scaffold establishment, the amount of pruning should be just sufficient to maintain the scaffold form and size of the mature canopy. Heavily pruned pear trees will bear more water sprouts, which along with soft new growth, are sources for Pear blight and Fireblight infection. While it is preferable to prune pear trees during the dormant season, if infection appears in spring, infected shoots should be pruned off immediately. Pruning shears should be sanitized between cuts using a solution of 10% bleach in water or isopropyl alcohol. The Fireblight bacterium enters the fruit tree through the blossoms, and can be isolated from the tree by pruning off infected shoots six inches below the level of infection. Infected shoots have wilted, scorched-looking leaves. Short shoots and fruit spurs borne directly on the trunk or at the base of scaffold branches should also be removed to eliminate possible Fireblight infection through these points, which could girdle the tree. Pear trees bear fruit on last year's and older spurs, like apple. The same spurs can continue to produce pears for more than a decade. While fruit thinning can be performed by early season pruning, most pear thinning should be done after fruit set, to avoid excessive pruning cuts.

Pruning Peach Trees

Upon implementation of the CLR Treatment Plan, six young peach trees will exist in the Cemetery and four peach older trees will remain in two block areas. None of them are located in orchards, but instead are

associated with residential blocks of the War Relocation Center Period, where trees from the Manzanar Town Era were cultivated singularly, or new trees were planted singularly. Two peach trees are located near the reconstructed mess hall in Block 14, and two peach trees are located in Block 29.



Figure 38: Contemporary photo of a peach tree located in Block 29 (PWRO, 2010).

Peach trees bear fruit on last year's wood, but the wood will only have one crop of peaches, i.e., bear for only one year. Relatively heavy winter pruning of peaches is needed to stimulate the production of new fruit-wood for the next year's crop. In other words, it is necessary to sacrifice some fruit by pruning off last year's wood in this dormant season, in order to get more fruit the year after this one. Some heading back and thinning out of peach trees should be performed annually in winter. Limit summer pruning to just removing dead or diseased wood, in order to protect against sun scald. If Fireblight infection appears, prune off infected shoots immediately. Pruning shears should be sanitized between cuts using bleach solution or isopropyl alcohol. The Fireblight bacterium enters the peach tree through the blossoms, and can be isolated by pruning off blighted shoots six inches below the level of infection.

Pruning Apricot Trees

One apricot tree exists within Manzanar NHS. The apricot is a seedling, possibly associated with the Relocation Center Period crop cultivation in the Victory Garden near Block 12. The tree is probably not derived from a historic rootstock sprout.



Figure 39: Contemporary photo of an apricot tree in the Victory Garden near Block 12 (PWRO, 2010).

Apricot trees bear fruit on last year's fruit spurs, or last year's tertiary branches. However, apricot fruit spurs are short-lived, and so heavier pruning is needed to stimulate new wood and new spur production. In addition, the terminal shoots of apricot trees tend to become long and willowy unless they are headed back to desirable lateral secondary or tertiary branches. Perform pruning cuts in winter unless Fireblight infection appears in spring, in which case infected shoots should be pruned off immediately. Pruning shears should be sanitized between cuts. The Fireblight bacterium enters the apricot tree through the blossoms, and can be isolated by pruning off blighted shoots six inches below the level of infection.

Pruning Fig Trees

Three fig trees exist within Manzanar NHS. The fig trees are not part of an orchard, but were cultivated singularly in the Relocation Center Period among the residential blocks of Block 12.



Figure 40: Contemporary photo of a fig tree in Block 12 in dormant season (PWRO, 2010).

The Manzanar NHS fig trees bear two crops of fruit per year, one in the spring and one in the fall. Fig trees only bear fruit on one or two-year old wood, and so wood should be renewed annually to produce fruit. Fig

trees should be moderately headed back and thinned out to stimulate new wood production, and to control the height of the tree. Pruning may be performed in winter or spring, though spring is preferable as new sprouts stimulated by pruning will be vulnerable to frost. Note: the fig trees are not vulnerable to Tule elk browsing but may become habitat for pack rats if organic debris is allowed to accumulate at the base of the multi-trunks.

Mowing

Mowing is needed to manage orchard floor vegetation and the ground cover beneath the outlying fruit trees. Without management, the ground cover may out-compete the fruit trees for water, nutrients and eventually, light. Taller ground covers also provide more attractive habitat near fruit trees for rodents and other pests. Mowing is a current operation at the park that will be modified when a future cover-cropping treatment is implemented. The following sections describe the current operation and the future recommended operation.

Current Mowing Operations

Mowing is currently performed between March and November to control the height and spread of ground cover vegetation, such as Tumbleweed, Licorice Root, Tamarisk and Saltbrush. These plants compete with the fruit trees for water, nutrients and provide shelter for ground squirrels. Mowing is performed beneath the fruit tree canopies

with a string trimmer, and between rows of trees with a low-impact tractor mower. Tractor mowing occurs only in the Lydston and Wilder Orchards; these areas currently have the most fruit trees and therefore the largest drip irrigation systems, leading to most ground cover growth and need for mowing. Mowing is also periodically performed in the Lafon, Wilder North Orchard areas and the Outlying Fruit Tree areas (such as the Hatfield Orchard Remnant) however, using a string trimmer. The current mowing operation is labor intensive and can be reduced in scope through the use of mulch in the root zones of fruit trees and cover cropping outside the mulched areas.

Recommended Future Mowing Operations

In the future, mowing operations can be reduced in scope and frequency by mulching and cover cropping. Mulching within the dripline of the canopy of all fruit trees (including all Outlying fruit trees) will retard unwanted vegetation and weed growth and eliminate the need for string trimming beneath tree canopies. Cover cropping in the Lydston, Wilder and future Wilder North Rehabilitation Orchard areas will suppress weeds and other ground covers, and reduce the frequency of tractor mowing. With cover cropping, tractor mowing is timed to occur after seed ripening of the cover crop, resulting in fewer mows. See “Cover Cropping” and “Mulching” for more information. String trimming will still be needed in the Lafon and Wilder North (block) areas.

Weeding

Weeding is needed to remove any vegetation within or near the root zones of fruit trees that will compete for water, nutrients and light or shelter pests. Weeding is currently performed between March and November by hand-pulling, hoeing, or using a string trimmer. The scope and frequency of weeding can be reduced in the future through the use of mulch beneath each fruit tree, including all orchard areas and all the Outlying Fruit Tree areas. Removal of large Black locust or Tamarisk trees that have invaded the root zones or driplines of fruit trees should be approved by a Cultural Resource Specialist. Some Black locust and many Tamarisk trees in the park are historic and may be preserved.

Mulching

Mulching involves the application of a permeable layer of material on the soil surface within the root zone of the fruit tree. Depending upon the material used, mulches function for water retention, weed suppression and soil nutrition. At Manzanar NHS, the recommended mulch will serve all of these purposes and as a result, reduce the scope of mowing and weeding operations and promote greater longevity of the fruit trees. The recommended mulch is coarsely chipped Black locust wood mulch, applied to a maximum depth of six inches. The mulch may be generated at the park through the chipping of cleared Black locust brush. The mulch should cover the entire root zone of the fruit tree (just beyond the dripline of the canopy) but should not be allowed to touch the trunk of the tree, which could potentially cause disease problems. The mulch can

be applied on top of the drip irrigation hoses. These coarse-sized chips, thickly applied, will resist becoming blown away in the frequent high winds of the Owens Valley. The mulch will slowly break down over time and should be re-applied on a maximum cycle of five years.

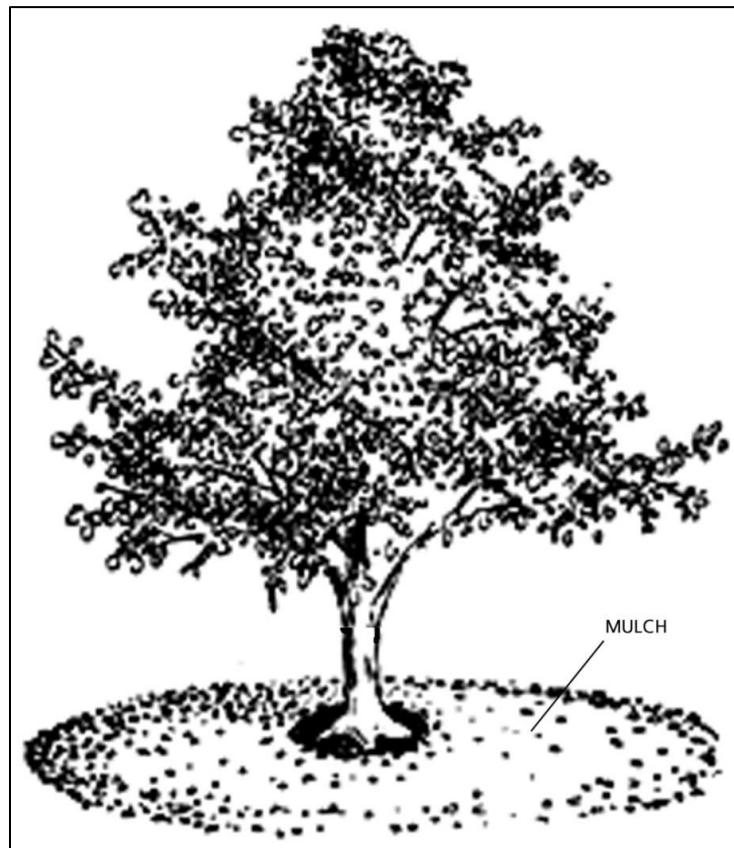


Figure 41: Diagram of recommended mulch zone. Mulch should be pulled away from trunk of tree and extend to dripline of canopy (<http://www.tree-landscape-service.com/images/mulch2>).

Disking and Cover Cropping

Currently, no disking and cover cropping are performed in the park orchards. This activity is a recommended operation for future preservation maintenance of the fruit trees in the Lydston, Wilder and Wilder North Rehabilitation Orchard.

During the early 20th-century, cover crops became the accepted norm for commercial orchard ground covers. Orchardists understood that cover crops would nourish topsoil, prevent soil erosion, out-compete perennial weeds and improve the organic matter content of the soil. Nitrogen-fixing legumes such as mustard, alfalfa, buckwheat, clover, vetch, and pea were all used as cover crops in California orchards during this period. A disk harrow, used for cover cropping, is shown in a historic photo of a Manzanar orchard in the 1930s. Since the cessation of orchard operations with the closing of the War Relocation Center, the topsoil has gradually become devoid of organic matter, resulting in lower fertility and water-holding capacity. Despite high mineral content, Manzanar soil nutrients are unavailable to fruit trees without the decomposing effects of soil microorganisms. Microbial activity is stimulated by organic matter, causing the release of mineral nutrients and their absorption by plant roots. Consequently, the role of the cover crop is significant and highly recommended in the future.

Future Recommended Disking and Cover Cropping Operations

Cover cropping using a cold and drought tolerant non-invasive plant, such as Hairy vetch (*Vicia villosa*) or a California native Vetch, is recommended to improve soil fertility and reduce erosion. Cover cropping requires the annual establishment of a seed bed, sowing seed, mowing the cover crop after seed ripening, and then disking the cover crop into the soil in the late summer or early fall. The work can be performed with the low-impact tractor using a disk harrow attachment, a grain driller, and a rotary mower attachment. As this operation involves soil disturbance, the areas to be disked should be tested for archeological resources before disking, and then monitored by an archeologist during disking operations.

Vetch should be annually sown after the first precipitation in October or November, into a lightly prepared, firm and weed-free seed bed. Seeding is recommended using a grain drill rather than by broadcasting, to achieve a uniform shallow bed for the seed in contact with soil moisture. The drill depth is from one and a-half to two and a-half inches at an application rate of 30 pounds of seed per acre. Vetch will begin flowering in mid April, and begin to ripen seed in mid May. The first mowing can be performed in late May, to scatter the ripened seed. Mowing can be repeated periodically, to manage the height of the cover crop to allow visitor access. The crop can be plowed under in late summer or early fall using a disk harrow and will serve as a green manure. Alternatively, the cover crop can be low-mown and left on the orchard floor, where it will serve as both mulch and upon decomposition, as a

green manure. In the latter scenario, the orchard is not subsequently disked or sown with new seed. Annual cover crop reestablishment is dependent upon natural seed dispersal during seed ripening and mowing. The no-disk/no-sow scenario will result in a less dense cover crop canopy. Cover cropping should be performed in conjunction with mulching of the root zones of fruit trees. Cover crops and disking should only occur in non-mulched areas, to avoid tree root damage by disking. Disking should also not occur in the block areas (i.e., around the Outlying Trees and in the Lafon and Wilder North Orchard areas), to avoid damage to archeological deposits.

Fencing

Fencing is needed to protect the historic fruit trees of Manzanar NHS from browsing animals. The park's preferred method of providing fence protection is to replace the boundary fence with an elk-proof design that has no gaps. Currently, most of the fruit trees in the park are unprotected. In lieu of a new elk-proof boundary fence, a temporary measure is needed to protect the trees' lower limbs from the predations of Tule elk and other browsing animals, therefore allowing them to assume their historic tree form and character. Temporary fencing or the use of browsing animal repellants is recommended for browse-threatened fruit trees in the near future. Fencing is an alteration of the cultural landscape that has a visual impact on landscape character and the visitor experience. As a result, fencing must meet rehabilitation requirements for compatibility with the historic landscape character as identified in the *Secretary of the Interior's Standards for the Treatment of Historic Properties*, as well as meet elk-proofing specifications.

Historically during the Manzanar Town Era and War Relocation Center Period, browsing mammals in orchards were controlled by hunting, or by being scared away by field workers. Tule elk were less numerous than they are today, having been hunted to near extinction by the end of the 19th-century. A subspecies of elk native to California, the Tule received federal protection in 1971, and the population has somewhat recovered in the Owens Valley. Today, the Tule elk are daily visitors to the park, where they forage on apple, pear, peach and apricot tree foliage and bark, among other vegetation. The fig trees appear to be untouched by the elk and other browsing mammals. Elk damage to the historic fruit trees includes loss of foliage, broken limbs, and stripped bark. Affected trees have a browse height below which new scaffold limbs cannot regenerate or secondary branches emerge. Severely browsed trees are killed through a complete loss of live canopy.

The Manzanar fruit trees are perpetually “limbed up” by the Tule elk, resulting in a tall trunk and a high canopy, a tree form uncharacteristic of the early 20th-century. The low-headed, short trunked tree is one quintessential form of the Manzanar Town Era and Relocation Center Period; a deliberate departure from the 19th-century, when fruit trees were grown with tall trunks and high canopies. Browse protection is critical to allow for the restoration of the historic form of the fruit trees, and to permit the establishment of new and replacement trees in the future. A combination of elk-proof fencing and chemical repellent is essential to this effort. Fencing whole orchard areas rather than individual fruit trees is the recommended approach to temporary fencing. Individual fences in an orchard have a greater visual impact as an array of cages, and present obstacles to work on individual trees. Temporary fences are recommended for the following orchards: Lafon Orchard; Lydston Orchard; Wilder Orchard; Wilder North Orchard.

Two alternative fencing plans are endorsed by the park. The two alternative alignments for future fencing are shown on the following Orchard Fencing Plans.

TEMPORARY WIRE FENCING
(SEE ELEVATION DRAWING
FOR RECOMMENDED DESIGN)



TEMPORARY ORCHARD FENCING PLAN ALTERNATIVE 1
FOR EXISTING CONDITIONS AND FUTURE TREATMENT

TEMPORARY WIRE FENCING
(SEE ELEVATION DRAWING
FOR RECOMMENDED DESIGN)



TEMPORARY ORCHARD FENCING PLAN ALTERNATIVE 2
FOR EXISTING CONDITIONS AND FUTURE TREATMENT

Recognizing the park's preference is to replace the park boundary fence with an elk-proof fence, rather than install temporary fencing around the orchards, the following design guidelines are recommended for the temporary fencing plan, alternative 1 or 2.

Temporary Fence Design Guidelines

- The fence material should be compatible yet distinct from the historic features of the Manzanar cultural landscape. In accordance with the *Secretary of the Interior's Standards for Rehabilitation*, alterations should be distinguishable from original features yet compatible with the historic character. Galvanized, welded wire mesh, hardware cloth and barbed wire are acceptable materials for the fence panels. One and a-half to two and a-half inch galvanized tubular steel is an acceptable material for the fence posts. T-posts with white tips are eye-catching and should be avoided. Black coated wire mesh and posts are visually inconspicuous and are also acceptable.
- The fence specifications must resist the elks' ability to cross over and under fences, according to the Bureau of Land Management⁸. The minimum height requirement is 45 inches,

⁸ Ferrier and Roberts "The Cache Creek Tule Elk Range". BLM, Nevada and California, P. 7. 1973. This report indicates that the Tule elk technique for crossing over fences is not a "jump" like that of a deer, but rather a rearing up on their hind legs and then arching their body over in a forward-push. Adults cross fences only 36 inches high, but do not cross fences exceeding 45 inches. Calves can jump 36 inch fences but prefer to go under or through them. Fence under-crossings used by adults range from 30

but 60 inches is preferred. The lower 36 inches should consist of net wire, such as welded wire mesh or hardware cloth. Above the net, barbed wire strands should be stretched between the posts at a maximum interval of eight inches. Gates must equal the height of the fence and the infill must be tight to the ground. Both equipment access gates and universally access visitor gates are needed.

- Fence posts must be installed at intervals sufficient to maintain tension in the low net wire and upper wire strands. A post interval of eight feet is recommended. Posts must be well-anchored to prevent lateral movement. Concrete post footings, two feet deep, are recommended. As footing installation requires ground disturbance, post footing locations should be marked and receive archeological testing before installation.
- The fence design and layout must allow visitor access along the historic circulation system of the cultural landscape and via the interpretive trail system, through a series of elk-proof gates. Gates must equal the height of the fence and the infill must be tight to the ground. Both equipment access gates and universal access visitor gates are needed. A recommended “kissing gate” style follows.

inches to 60 inches in height. Bulls must thread their antlers under the wire but can still negotiate the under-crossing. Calves can easily cross under an 18-inch spacing.

- Fences should remain in place for approximately 10 years, until mature scaffold limbs have established. Fences should receive frequent inspections for damage, and be repaired as necessary.

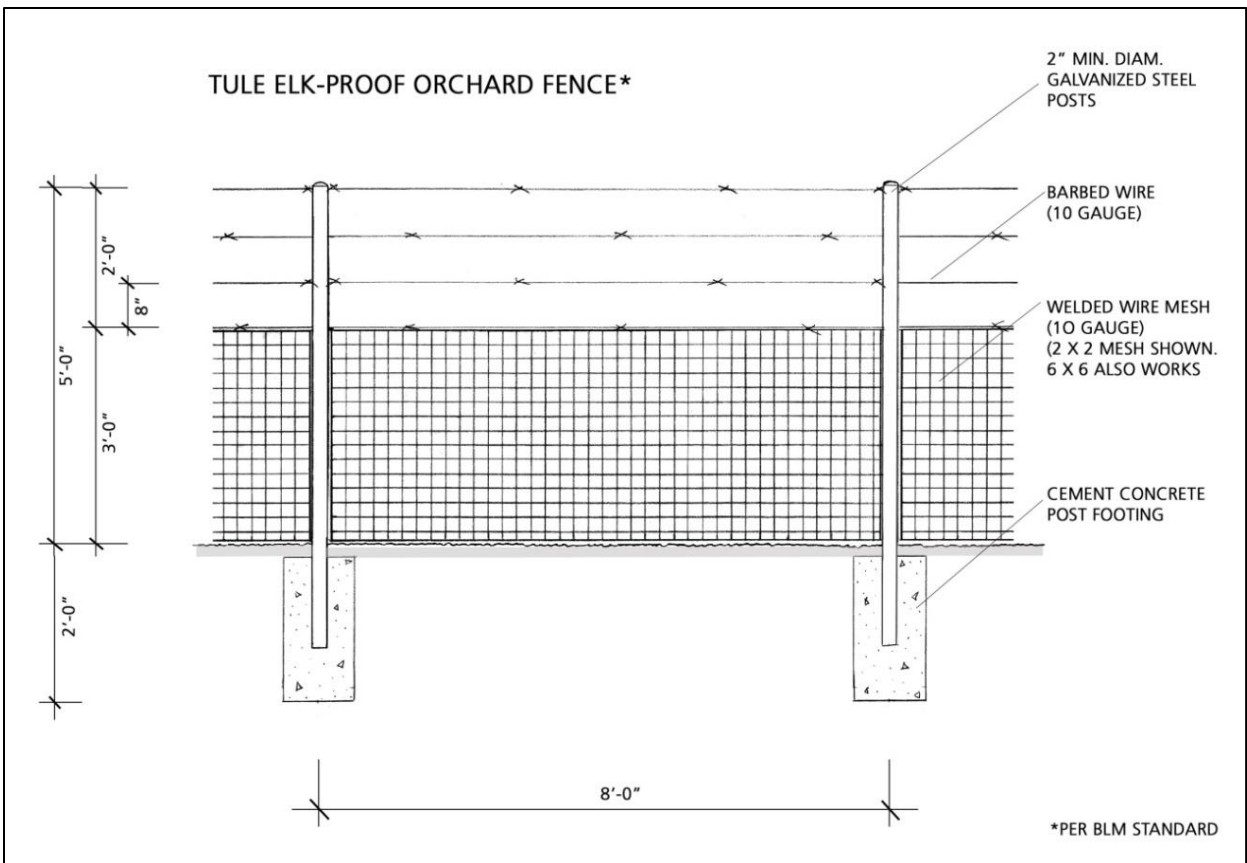


Figure 44: Elevation drawing of a recommended 10-year orchard fence design. The design is based on a Bureau of Land Management standard for Tule Elk exclusion, and is compatible with the historic character of the cultural landscape. The fence should be located behind Black locust, Tamarisk and Cottonwood screening, to the extent possible (PWRO 2010, adapted from BLM, 1973).

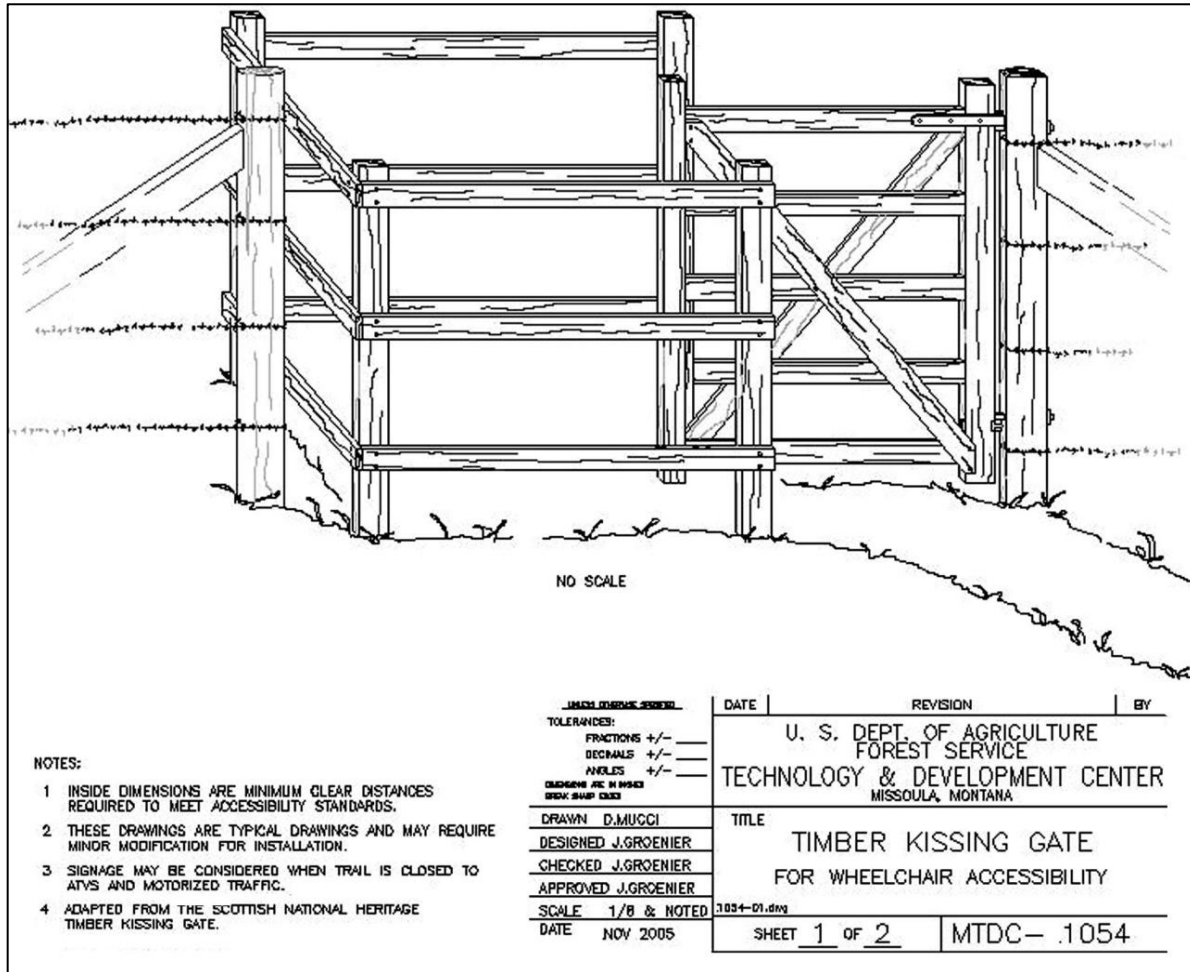


Figure 45: Sketch drawing of a recommended universally accessible gate design for park visitors. The design is based on a USFS Technology and Development Center concept for an accessible trail gate, derived from the “kissing gate” style common in Europe for livestock inclusion (the name is derived from the fact that the gate “kisses” both sets of posts as it swings). No gate latch is needed. The gate specifications need to be adapted to match the specifications of the Tule Elk exclusion fence. (USFS, 2005).

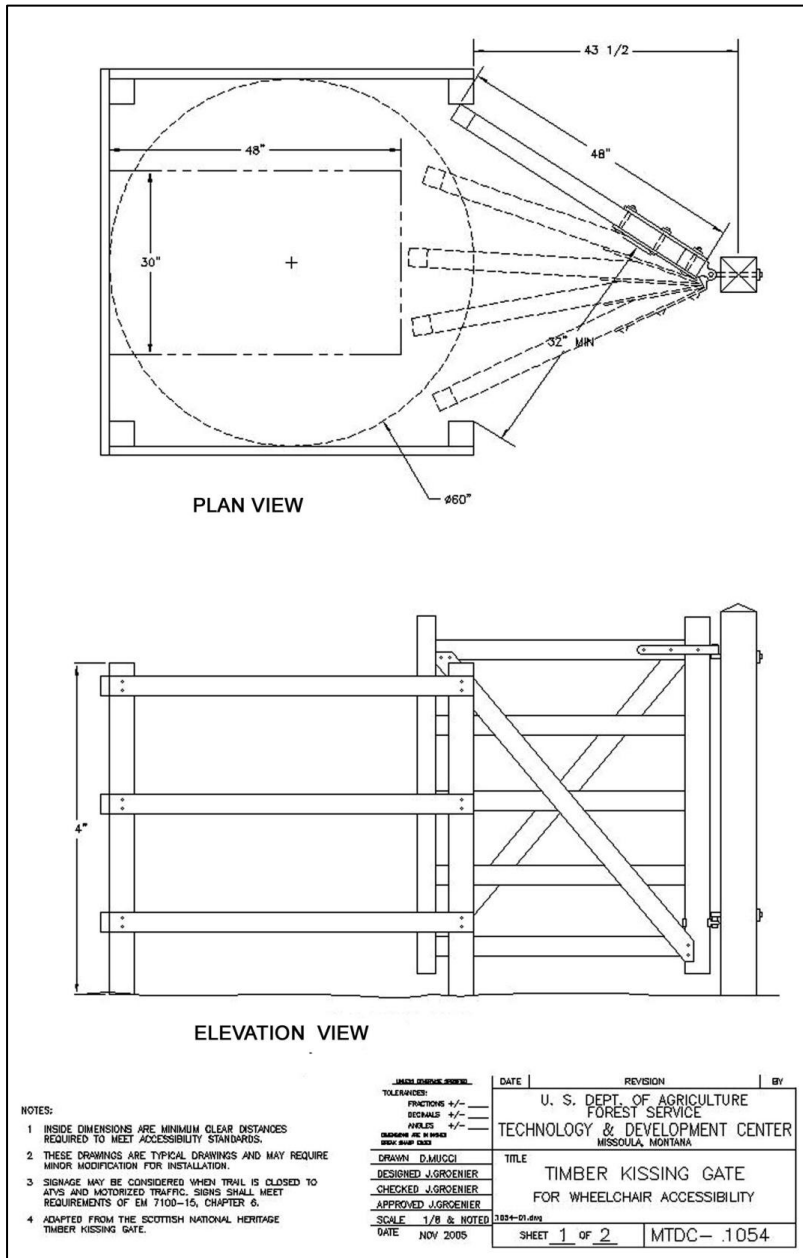


Figure 46: Design details of a recommended universally accessible gate design for park visitors. The design is based on a USFS Technology and Development Center concept for an accessible trail gate, derived from the “kissing gate” style common in Europe for livestock inclusion (the name is derived from the fact that the gate “kisses” both sets of posts as it swings). No gate latch is needed. The gate specifications need to be adapted to match the specifications of the Tule Elk exclusion fence. (USFS, 2005).

Chemical Repellants

Chemical repellants may be used to treat individual fruit trees that for various reasons, including resource protection, visitor experience or operational needs, cannot be fenced. For example, after treatment implementation in the Cemetery, six new peach trees will be planted in this visually and experientially sensitive area, where fencing would be inappropriate. Here the use of chemical repellant such as “Liquid Fence” is recommended, along with other Outlying Tree Areas, such as the Block 14 peach trees or the Block 29 peach trees. Chemical repellants have limited viability however, and must be weekly re-applied on a weekly basis to cover new foliage.

Irrigation

Irrigation System

Three of the four park orchards are irrigated by a drip irrigation system: Lydston, Wilder and Wilder North. The Lafon Orchard and the outlying fruit trees are currently hand-watered from a tanker truck. The Lafon Orchard may be supplied with an irrigation system in the future, potentially fed by a well located southwest of the orchard, or a new well.

The current irrigation system is supplied by a historic well providing more than 2000 gallons of water per day. The well is located outside of

the camp blocks, north of 9th Street near the east-jog in F Street. The system's pump is powered by solar energy stored in batteries that are supplied by photovoltaic panels. The pump feeds a 2" PVC mainline pipe, aligned beneath the east-jog in F Street. The mainline runs underground approximately north to south along the east boundary of the Wilder North, Wilder and Lydston Orchards. The mainline is tee-ed into 2" lines that run approximately east to west, penetrating the midpoint of columns of fruit trees in each orchard. Each 2" line is tee-ed to a 1" lateral that is tee-ed to two ½" driplines. The driplines loop above grade around the base of each fruit tree, delivering water directly to each root zone via in-line emitters. Each emitter supplies 0.62 gallons/foot. The driplines are located at approximately one third of the distance from the edge of the canopy to the trunk. This dripline location is suitable for supplying the mature roots while encouraging the outward spread of new roots.



Figure 47: Photo showing irrigation dripline looped around historic pear trees in the Wilder Orchard (PWRO, 2010).

The irrigation system is controlled by eight valves. One valve is located in each of the Wilder North and Lydston Orchards, and six valves are located in the Wilder Orchard. Between March and November, the irrigation system is operated for one day's duration per tree per week by opening four of the eight valves on one day, and the other four valves the next day. On watering days, inspections are required to detect leaks caused by coyote or ground squirrel damage, and make any necessary repairs. The current system effectively delivers the quantity of water needed by the fruit trees to prevent stress from drought conditions. The consumption of irrigation water may be reduced in the future however, upon implementation of cover cropping and mulching practices recommended by this OMP. Cover cropping will introduce more

organic matter into the soil, creating greater water holding capacity, and mulching will reduce the evaporation of irrigation water, keeping root zones damp for a longer duration. Driplines may be hidden beneath the mulch layer. This may help to protect them from wildlife damage.

Hand Watering

The Lafon Orchard and the outlying fruit trees, including the Hatfield Orchard Remnant, are currently hand-watered. Water is supplied by a buffalo truck, with a 1000 gallon capacity. Eight buffaloes are required to water the Lafon Orchard and the outlying fruit trees, consuming approximately 2 days per week per park laborer (currently one hour is needed to fill one buffalo from the well, and one round trip of filling and hand watering can be made in two hours). Each hand-watered tree has a small soil berm outlining the root zone, to create a basin to detain the water. Hand watering is less effective than the drip irrigation system in supplying adequate water for the fruit trees. Hand watering results in a more rapid delivery of water, causing some waste due to infiltration, run-off or evaporation. Placement of mulch around the fruit trees will make hand-watering more effective, by reducing evaporation from root zones. Hand-watering is likely to remain the most effective means of watering the outlying trees, as they are spread throughout the camp in small numbers. The Lafon Orchard could be more effectively watered in the future with a drip irrigation system; however, this would involve trenching with archeological testing, and activating a currently non-operating well.

Fertilizing

Fertilizing is needed to supply the fruit trees with an adequate balance of macro and micro-nutrients. The Manzanar NHS historic fruit trees are still growing and developing new limbs and roots, despite their age, due to the park's preservation maintenance program of winter pruning. Nutrients are currently supplied in a soluble synthetic fertilizer, delivered within irrigation water. The Nitrogen (N), Phosphorus (P) and Potassium (K) analysis of the current fertilizer used is 10:10:10. The nutrients are delivered during the first two weeks of July each year, when the fruit trees are actively growing and developing fruit. Currently, the use of soluble plant food is the most operationally effective method for delivering plant nutrients to the orchards and outlying fruit trees, and adequately supplies the need for nutrients.

Fertilizing procedures may be modified in the future through the implementation of cover cropping and mulching. Cover cropping and mulching will introduce more organic matter into the soil, increasing microbial activity and the breakdown of naturally-occurring mineral nutrients in the soil. In addition, the cover crop will supply the macro-nutrient Nitrogen, through Nitrogen fixation. Cover-cropping and mulching will stimulate greater soil-fertility, leading to a slower, but more sustained release of plant nutrients throughout the growing season. While synthetic soluble fertilizer is highly effective, it creates a rapid pulse of nutrients that are soon consumed. Using soluble fertilizer in combination with cover-cropping and mulching will provide a more sustained supply of plant nutrients in the future.

Pest Control

While most orchards are parasitized by a wide array of pests and pathogens, the Manzanar NHS fruit trees are relatively un-predated, potentially due to their geographic isolation and challenging environmental conditions. A handful of serious pests and diseases are problematic however, and while few in number, these pests have the potential to cause tree mortality. Fruit tree susceptibility to pests and diseases is increased when trees are stressed by their growing conditions. All fruit trees are better able to withstand infection or predation when they are sufficiently watered, nourished and not stressed by the competition of vegetation or browse damage. Maintaining good growing conditions through pruning, mulching, cover-cropping, mowing, watering and fertilizing is the park's first line of defense against pests and diseases. The serious pests of the Manzanar NHS fruit trees are ground squirrel and elk predation, and Fireblight and Leaf Blight infection.

California ground squirrels damage fruit trees by burrowing in tree root zones, where they feed on roots and expose roots to air, causing them to desiccate. Extensive burrowing within the root zone may destabilize a tree, by loosening soil and severing roots. Ground squirrels also feed in fruit tree canopies, gnawing on bark, shoots, leaves and fruits. Ground squirrels live in burrows and spend most of their lives in or within the vicinity of the burrow. Once a fruit tree or orchard area is colonized with a population, rapid root damage will ensue. Ground squirrels are controlled through poison baits, fumigation or live trapping. These animals are native to the area, and must be monitored and controlled on an on-going basis, in order to prevent reinvasion.

Live trapping is the environmentally preferred method of ground squirrel control, as fumigants or poisons may leave residues in the environment or be conveyed through the food chain. However, the use of poison baits may be necessary during heavy infestations. Poison bait is a common method of large scale ground squirrel control, as it requires less labor compared to trapping and achieves high efficacy results. Grain-based poison bait is located in bait stations (anticoagulants only) or broadcast by hand. Anticoagulants include Chlorophacinone and Diphacinone. These may require more than one application per year, but are less toxic to the environment than other baits. Zinc phosphide is more toxic, requires only one application per year, and may only be needed once every several years. Personal protective equipment must be worn when using poison bait for ground squirrel control, including gloves, long sleeves, pants and shoes; goggles and a respirator.

Live trapping is not the most efficient method of control, because of the high labor required to achieve good results, however, live trapping is the most environmentally inert methods of ground squirrel control. Ten to 15 live traps are needed per orchard area. Traps baited with nuts, grains or fruits are placed near burrows and are checked on a daily basis. Best overall results come from trapping squirrels just before they have their young. Carcasses should be removed with gloved hands, as ground squirrels can carry diseases harmful to humans. Live squirrels caught in traps can be dispatched by fumigation.



Figure 48: Example of a ground squirrel trap at the base of a pear tree in the Lydston Orchard (PWRO, 2010).

Tule elk is another serious pest of the Manzanar NHS fruit trees with the potential to cause tree mortality. Elk feed on bark, shoots, leaves and fruits, and may girdle trees, break scaffold limbs, or cause disease entry. Elk predation has also created a browse line within the tree canopies that has affected the historic character of the trees. Rather than exhibit the low-headed style of canopy distinct during the Manzanar Town Era and War Relocation Center Period, the trees have been limbed up through browsing, altering their appearance considerably. Chemical repellants have limited effectiveness in controlling elk throughout all areas. Protection should be provided by fencing. See the “Fencing” section for more information.

Fireblight and pear Leaf Blight are two serious pathogens of the Manzanar NHS pear trees and should be monitored and controlled. Fireblight, caused by the bacterium *Erwinia amylovora*, and Leaf Blight, caused by the fungus *Fabraea maculata*, have the potential to hasten tree mortality through the death of leaf, shoot and root tissue.

Fireblight is the most serious pathogen of the Manzanar NHS fruit trees. The disease affects pear, apple, apricot, and peach trees, as well as other members of the Rose family. It can destroy an entire orchard during one growing season. The term "Fireblight" describes the appearance of the disease, which makes leaves and shoots appear blackened, shrunken and cracked, as though scorched by fire. The bacterium infects open blossoms and tender new shoots and leaves during blossom time. Honeybees and other insects, birds, rain and wind can transmit the bacterium to susceptible tissue. Injured tissue is also highly susceptible to infection, such as the punctures and tears caused by ground squirrels and Tule elk. The blackened, necrotic lesions in the leaves and shoots produce a viscous exudate. This bacteria-laden exudate is then distributed to other parts of the same tree, causing secondary infections. The disease spreads most quickly during hot, wet weather and is dormant in the winter when temperatures drop. Infected tissue contains viable bacteria, however, which will continue to spread in warm weather the following spring.

The Fireblight bacterium spreads through the tree's vascular system, eventually reaching the roots and/or graft union, causing tree death.

Over-pruning and over-fertilization (especially with nitrogen) can lead to watersprouts and other midsummer growth that leave the tree more susceptible. The only effective treatment is to prune off the affected branches six inches below the infection, and remove them from the area. Trees should be routinely inspected for the appearance of new infections. The rest of the tree can be saved if the blighted wood is removed before the infection spreads to the roots.

Leaf Blight affects seedling pear trees more than variety trees, and therefore the rootstock sprout trees in the Manzanar NHS orchards are the most vulnerable. Leaf Blight appears in early spring soon after the first leaves develop. A small circular, carmine-red spot develops, first on the upper, and then penetrating to the lower, leaf surface. The spot's color soon changes to dark brown, with a slightly elevated, minute black spot in the center. Numerous lesions merge, turning the tissue between them brown. Affected young leaves shrivel; older ones turn yellow and fall prematurely. The infected pear fruit shows the same carmine-red spot which darkens over time. The skin becomes roughened and deep cracks appear in the flesh. Control is effective with Copper hydroxide, such as Kocide 101 at two to four pounds per 100 gallons of water, or four to six teaspoons per gallon of water), with the first applications between silver-tip and green-tip when fruit trees are in bud.

Fire Protection

Lightning and human-ignited brush fires are common within the Owens Valley. Slow or fast-moving, relatively cool or hot wildfires pose a threat to the historic orchards and fruit trees, as these species are not adapted to tolerate the effects of fire. Fire protection for the orchards and fruit trees should be provided through fuels reduction, and ongoing irrigation around the trees. Fuels reduction alters the speed and temperature of fires; irrigation reduces the probability of fire ignition or spread. Wildfire fuels are abundant throughout the park in the standing or downed dead trees, and accumulated woody debris. The historic orchards and outlying fruit trees are virtually surrounded by woody vegetation that has the potential to fuel a wildfire.

The Lydston and Wilder Orchards are edged in historic windbreaks of Black Locust, Tamarisk and Cottonwood trees that originated in the Manzanar Town Era. Black locust, Tamarisk, Tree of Heaven and other fast-colonizing trees have naturalized through the block areas, producing large amounts of downed dry debris. Fuels reduction projects have been implemented, by removing, hauling and chipping dead woody debris. Much more debris removal is needed however, and a systematic effort to remove all downed woody debris, hanging and attached deadwood within the perimeter of each orchard area is recommended. Deadwood and debris removal should be performed in consultation with a natural resources manager and a cultural resource specialist. The deadwood may be host to nesting birds or other wildlife and timing of the removal is important. The deadwood may also belong to historic vegetation, which may require documentation before removal. Non-fruit tree woody

debris may be hauled off and processed into mulch for the fruit trees. Orchard ground cover vegetation should be maintained at less than six inches tall, to further reduce wildfire fuels. Fuels reduction by deadwood removal may be a suitable activity for volunteer groups.



Figure 49: Woody vegetation and downed debris fire fuels, located near the Wilder Orchard (PWRO, 2010).

FACILITY MANAGEMENT SOFTWARE SYSTEM (FMSS) DATA

3100 Maintained Landscapes (ML)

The park's historic orchards and outlying fruit trees are part of the Manzanar NHS "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 and individual fruit trees are best captured in FMSS under the asset code 3100 module for Maintained Landscapes. This chapter provides data that should be entered into FMSS in order to manage the preservation maintenance and future treatment of the park's orchards and fruit trees.

Landscape Type ("LANDTYPE"): Agricultural Landscape

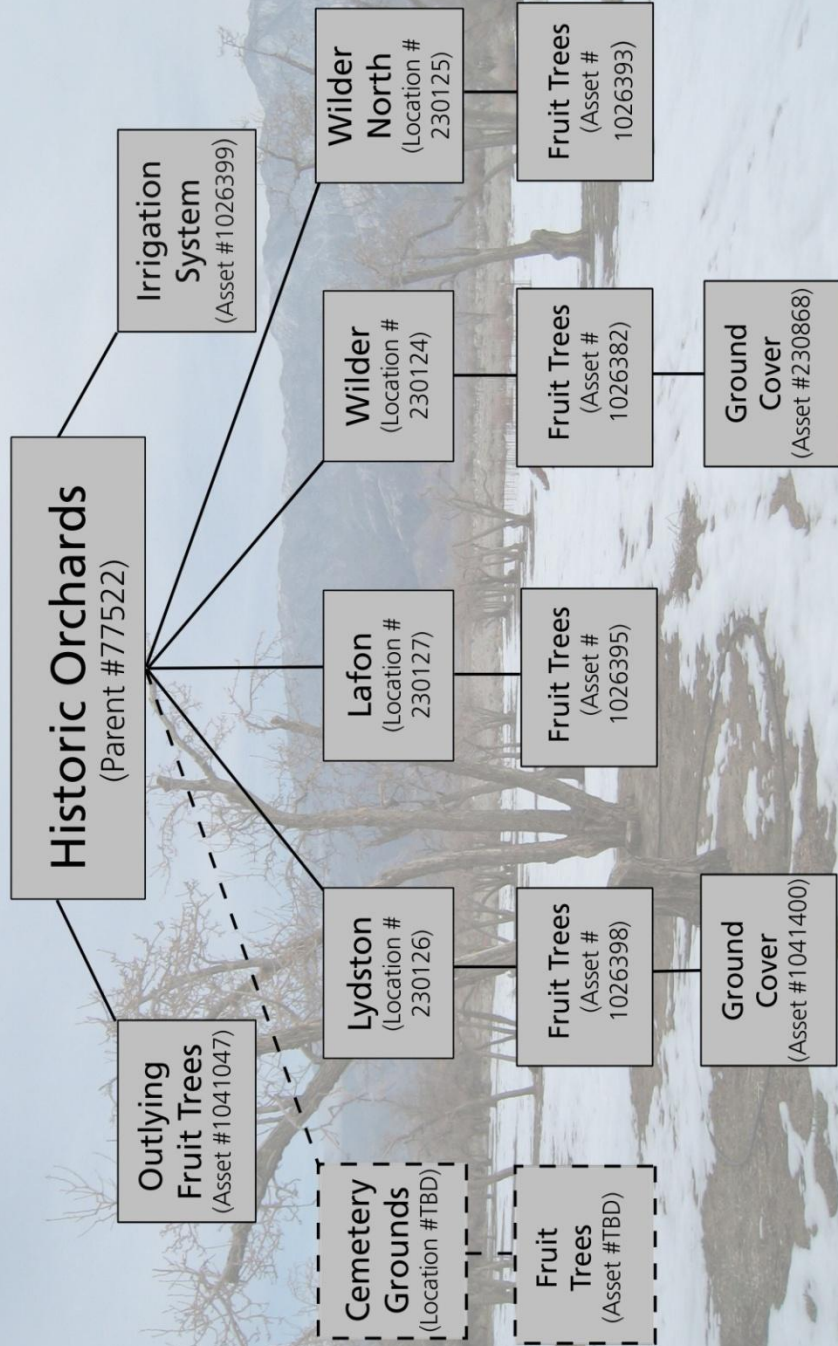
The Landscape Type attribute in the Location specification template allows the park to differentiate between and report on different types of maintained landscapes in FMSS. Landscape Type attributes are the basis for establishing separate ML location records within a park that are based on land use, purpose, function and character. The park must select a single Landscape Type attribute in the specification template for

location (similar to the Building Type for 4100-buildings), for each ML location record. Where a maintained landscape has more than one type, the primary Landscape Type is selected. Out of a total of 22 possible Landscape Types, the type “Agricultural Landscape” is recommended for the Manzanar NHS orchards and outlying fruit trees.

FMSS Hierarchy for ML Location Records

FMSS requires parks to organize location records using a hierarchy structure. Parent and children relationships establish the connection between the different levels of the hierarchy. The top of the hierarchy tree is the *site* record, followed by the *parent location* record. MLs are defined at the third level of the hierarchy – the *location* record. The *asset* records on which work is performed are at the lowest level of the hierarchy. The following diagram indicates the recommended hierarchy for the Manzanar NHS orchards and outlying fruit trees. Note a *parent location* record “*Historic Orchards*” is the hierarchy root for all orchards and outlying fruit trees. All of the outlying fruit trees (including the Hatfield Orchard Remnant) are captured in one *asset*; the individual historic orchards are captured as their own *location*.

Manzanar 3100-Maintained Landscapes Hierarchy



Asset Records

Maintained Landscapes (MLs) contain components that support and contribute to their composition and function. They must be inventoried and inspected to ensure the condition and function of the ML is effectively maintained. These supporting components are captured in FMSS as *asset* records. The assets of the orchard locations including the fruit trees, defined as one asset, and the orchard ground cover (to become a legume cover crop) defined as another asset. In the future, upon installation of the orchard fences, the fences should be captured as other assets of the orchard locations, as indicated in the table below. (Note: the irrigation system and the outlying fruit trees are captured as assets of the parent location.)

ML assets as defined by the Uniformat II Work Breakdown Structure (WBS), as standard used for all FMSS asset types. For Maintained Landscapes, the primary systems are found in Uniformat *G20 Site Improvements*, and in particular, *G2040 Built Features* and *G2050 Landscaping*. ML assets must be correctly identified and inventoried using the FMSS WBS sub-component codes and corresponding specification templates available under the 3100 asset code. The following table indicates the WBS codes that should be used in these applicable asset records.

ML Asset Records for Orchards and Outlying Fruit Trees				
WBS subcode	Asset Description	Spec. Template Title	Unit of Measure	Applicable Assets
G205007	Irrigation System	IRRIGTN	EA	Orchard Irrigation System (1044047)
G205008	Vegetation (Grouping - Same Species) (SF)	INPLANT	EA	Outlying Fruit Trees (1041047)
G205008	Vegetation (Grouping - Mixed Species) (SF)	MIXPLANT	SF	Lafon Orchard Fruit Trees (1026395)
G205008	Vegetation (Grouping - Same Species) (SF)	INPLANT	EA	Lydston Orchard Fruit Trees (1026398)
G205008	Vegetation (Grouping - Same Species) (SF)	INPLANT	EA	Wilder Orchard Fruit Trees (1026382)
G205008	Vegetation (Grouping - Mixed Species) (SF)	MIXPLANT	SF	Wilder North Orchard Fruit Trees (230125)
G205010	Vegetation (Field Crop or Grazing Pasture) (AC)	CROPLANT	AC	Lydston Orchard Groundcover (1041400)
G205010	Vegetation (Field Crop or Grazing Pasture) (AC)	CROPLANT	AC	Wilder Orchard Groundcover (230868)
G204001	Fencing	FENCE	FT	Lafon Orchard Fence (asset to be created)
G204001	Fencing	FENCE	FT	Lydston Orchard Fence (asset to be created)
G204001	Fencing	FENCE	FT	Wilder Orchard Fence (asset to be created)
G204001	Fencing	FENCE	FT	Wilder North Orchard Fence (asset to be created)

Work Management

The information contained within the “Existing Conditions” and “Treatment” chapters of this OMP will inform the determination of preventive maintenance (PM) and recurring maintenance (RM) needs and costs. The following list identifying the different work types of preservation maintenance activities to be performed on the Manzanar NHS historic orchard and outlying fruit tree assets.

- Facility Operations – Work activities performed on a recurring basis throughout the year that are intended to meet routine, daily park operational needs. Typical work includes operation of the orchard irrigation system, on-going fence repair, mowing, and weeding.
- Preventive Maintenance – Regularly scheduled periodic maintenance activities (within a year) on selected assets, including inspection and minor adjustment, such as winter and summer pruning, pest control, disking, cover-cropping, and mowing.
- Recurring Maintenance – Work activities that re-occur (i.e., cyclic in nature) based on normal wear patterns and that follow a periodic cycle of greater than one year and less than 10 years. Typical RM work includes mulching, fuels reduction, and propagation.
- Deferred Maintenance – Work activities that are overdue or that need to be performed immediately because of an identified deficiency or problem. DM includes PM and RM that have not been performed on time. Typical DM work in orchards includes

rejuvenative pruning, however, at Manzanar NHS, no DM pruning work is needed, due to successful stabilization efforts already implemented. Fuels reduction is the only DM type of work needed in 2010.

Work Orders

The following FMSS work orders are recommended for the Manzanar NHS historic orchard and outlying fruit tree assets.

1. Fruit Tree Pruning (5254819)

Description: This work includes winter and summer pruning.

Winter Pruning

Timing: December and January

Objectives: Balance scaffold and limb structure of old trees; develop scaffold structure of new trees; reduce wind-sail effect; thin new growth, remove root suckers; remove water sprouts. Clean-up of debris after pruning.

Summer Pruning

Timing: July (greatest need in Lydston Orchard)

Objectives: Remove epicormic growth from trunks, scaffold limbs and smaller branches (including water sprouts). Remove root suckers. Clean-up of debris after pruning.

Work Type: FM
Sub Type: PM
Target Start: 7/1/2010 (summer pruning)
Target Finish: 1/31/11 (winter pruning)
Duration: Variable

2. Fruit Tree Watering (Hand and Drip Irrigation) (5255372)

Description: This work includes watering of the orchards and isolated fruit trees by hand (with a water buffalo) and with the drip irrigation system.

Hand Watering

Timing: March to November
Objectives: The Lafon Orchard and outlying fruit trees are hand watered. Work involves filling the 1,000-gallon water buffalo from the well and driving to fruit tree locations to dispense the water. A total of 8 water buffalos are needed to complete hand watering.

Irrigation System Watering

Timing: March to November
Objectives: The Lydston, Wilder and Wilder North Orchards are watered with the irrigation system. Work includes daily inspections and repair of the system to check for wildlife damage to the lines. Work also includes daily control of the system by manually operating the valves. The system has 8 valves. Four of the valves are turned on daily, requiring 2 days to complete watering.

Work Type: FO
Sub Type: GC
Target Start: 3/1/2010
Target Finish: 11/30/10
Duration: 360 hours

3. Fruit Tree Pest and Wildlife Control (5255492)

Description: This work includes spraying fruit trees for disease Fireblight and Leaf Blight disease prevention and trapping ground squirrels.

Spraying

Timing: March through June.
Objectives: Work involves spraying fruit trees to coat foliage with Copper Hydroxide to protect against various bacterial and fungal diseases. Lime sulfur may also be used.

Trapping

Timing: March through November.
Objectives: Up to 10-15 traps are used per orchard area. Work involves baiting, inspecting and emptying traps on a daily basis.

Work Type: FM
Sub Type: PM
Target Start: 3/1/2010

Target Finish: 11/30/10

Duration: 520 hours

4. Fruit Tree Mulching (5255587)

Description: This work involves the application of shredded Black locust mulch within the dripline of all fruit trees.

Mulching

Timing: Any time of year, repeated every 5 years.

Objectives: Apply mulch within the driplines of fruit trees to suppress weeds and water evaporation. A six-inch depth of mulch should be applied per tree. Mulch should be pulled 1 inch away from tree trunks to prevent decay of trunk. Mulch should not consist of fruit tree wood chips.

Work Type: FM

Sub Type: RM

Target Start: Variable

Target Finish: Variable

Duration: 160 hours

5. Orchard Location Vegetation Management (309132)

Description: This work involves weeding and vegetation management of brush and fire fuels.

Weeding

Timing: March to October

Objectives: Use of string trimmer to control weeds within the dripline of all fruit trees.

Vegetation Management

Timing: Any time of year.

Objectives: Clearing of dead woody plant material within orchard locations by flush cutting and debris removal.

Work Type: FM

Sub Type: PM

Frequency: 1 week

Seasonal Dates:

March 1-November 30

October 1-September 30

6. Orchard Floor Maintenance (309133)

Description: This work involves mowing, cover cropping and disking.

Mowing

Timing: March to November

Objectives: Mowing to control height and type of orchard floor vegetation between rows of fruit trees. Orchard floor vegetation should be managed at a height of 6 inches or less.

Cover Cropping

Timing: October or November

Objectives: Prepare orchard floor for seed bed by chain harrowing, sow cover crop in wet season. Spread seeding with a grain drill. The drill depth is from one and a-half to two and a-half inches at an application rate of 30 pounds of seed per acre.

Disking

Timing: Late summer or fall (after seeds set)

Objectives: Using a disk harrow set at 6 inch depth, turn under the cover crop to incorporate crop residue.

Work Type: FM

Sub Type: PM

Frequency: 1 year

Seasonal Dates: March 1-November 30

ORCHARD TREATMENT

Management Objectives

Management objectives for the treatment of the Manzanar NHS orchards and outlying fruit trees are derived from the park's General Management Plan (GMP/EIS), the Cultural Landscape Report (CLR) Treatment Recommendations and Manzanar NHS park staff through the OMP planning process. These long term planning documents define the objectives for the park and the cultural landscape that integrate the significance and integrity of the park's resources, the existing conditions, the interpretive goals and visitor use and experience with operational constraints.

The GMP outlines the following management objectives for the park's orchards:

- Historic plant specimens and major extant orchards, dating from pre-camp days, would be preserved and perpetuated through cuttings or seed propagation.
- Irrigation would be provided as needed.

The CLR provides the following management objectives for the park's orchards:

- Stabilize and where feasible, enhance longevity of remnant orchard trees using guidelines established in the Landscape Stabilization Plan, 2005 (LSP).
- Manage orchards to retain historic character including tree structure, form, spacing, and type established during the Manzanar Town Era and actively managed during the War Relocation Center Period.
- Replace missing trees using historic scionwood and rootstock. If unknown, use extant material from on-site dating to the historic period.
- Eliminate any fuel ladder conditions around historic fruit trees by cutting low-growing vegetation (e.g., grasses and shrubs) and removing fallen dead wood in orchard areas.
- As part of an Integrated Pest Management Plan, consider use of chemical repellents to protect historic fruit trees from wildlife as a means to avoid the construction of permanent non-historic fencing, particularly in areas visible from the tour route.

- Use temporary fencing (e.g. metal stakes and wire) around new plantings or threatened trees until such time that the trees are tall or strong enough to withstand impacts from wildlife.

In the preparation of this OMP, park and other NPS staff identified the following management objectives for the park's orchards and outlying fruit trees:

- Preserve and manage the Manzanar NHS orchards and outlying fruit trees in the camp barrack blocks to accurately depict the characteristics of the trees during the period of significance, (1942-1945) so that the National Historic Landmark property is able to convey the appearance of the landscape during the War Relocation Center Period.
- Preserve and manage the Lydston, Wilder and Wilder North orchards to accurately depict the characteristics of the trees during the Manzanar Town Era period of significance, (1910-1924) so that the National Historic Landmark property is able to convey the agricultural origins of the landscape.
- Manage the orchards and outlying fruit trees for overall landscape character, rather than for fruit yields or quality fruit production. Fruit production is desirable for interpretation, but should not drive orchard management practices.
- Conserve the full complement of historic fruit tree germplasm extant within the park (i.e., species and varieties). The

germplasm, to be preserved in-situ or through an off-site conservation repository, includes apple, European pear (varieties Bartlett and Comice), Asian pear, apricot, peach and fig.

- Depict an apple orchard, the Spanish namesake for Manzanar, within the park cultural landscape, to be visible from the auto or walking tour routes.
- Create a treatment plan for the orchards and outlying fruit trees that can be feasibly implemented within the park's existing funding and operational constraints.

Applying the Secretary of the Interior's Standards to Orchard and Fruit Tree Treatment.

The OMP treatment plan incorporates three types of treatment: Preservation, Restoration, and Rehabilitation for different orchard areas. These treatments are defined by the *Secretary of the Interior's Standards for the Treatment of Historic Properties*. The NPS is bound by Cultural Resource Management Policy to follow the Secretary of the Interior's Standards. Concise definitions follow.

- *Preservation* is defined as the act or process of applying measures to sustain the existing form, integrity and materials of a historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon ongoing maintenance and repair.

- *Restoration* is defined as the act or process of accurately depicting the form, features and character of a property as it appeared during the period of significance by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period.

- *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 cultural values. A cultural landscape's characteristics and historic features are protected and maintained as they are in the treatments "preservation" and "restoration," but due to a greater amount of deterioration of historic features or number of missing or non-historic features, repair and replacement is required. This treatment allows for the replacement of deteriorated, missing or incompatible features with traditional or compatible substitute materials.

Preservation Actions

As directed by the park's GMP and CLR, the ultimate treatment for all historic orchards and outlying fruit trees will be "preservation". While the four historic orchards are prescribed with differing short-term treatments in this OMP, upon implementation, the work will return to a focus on preservation. Preservation involves the following actions:

- *Retain and preserve historic features and materials:* retain and preserve historic orchard spaces, historic orchards and fruit trees through the preservation maintenance activities described in this OMP, to perpetuate the historically accurate tree species, varieties, tree type, tree form and spacing.

- *Repair historic features:* repair damage to historic fruit trees, with the least degree of intervention possible, using fencing, staking, rejuvenative pruning, and bridge grafting across large wounds or cavities.

- *Replace deteriorated historic features:* replace in-kind historic fruit trees that have deteriorated beyond repair (i.e., beyond the point of rejuvenative pruning) with the same genetic stock or same species and variety, tree type, tree form and spacing.

- *Replace missing and incompatible features:* replace missing or incompatible fruit tree, such as rootstock sprout trees, and replace with historically accurate tree species, variety, tree type, form and spacing.

OMP Treatment Plan

The OMP treatment plan outlines differing treatments for the following orchard areas: Lafon, Lydston, Wilder and Wilder North, the Cemetery, and the outlying fruit trees (including the Hatfield Orchard Remnant). These differing treatments are designed to fulfill the aforementioned management objectives provided by the GMP, CLR and park staff, while optimizing the visitor experience and operational capacity. Orchard treatment may be funded by *Recreational Fee Demonstration* funds, *Repair/Rehab* and *ONPS base* sources, among others.

As indicated earlier in this chapter, after implementing the differing treatments for each orchard area, the ultimate treatment for all of the park's orchards and outlying fruit trees is *preservation*, through the on-going use of preservation maintenance techniques. On-going preservation maintenance can be funded by *Regular Cyclic Maintenance* and *Cultural Cyclic Maintenance* sources, among others. Some preservation maintenance activities are suitable for volunteer groups, such as mulching, debris removal, weeding, and fence repair.

Lafon Orchard Treatment Plan: Rehabilitation

Prior treatment guidance provided by the CLR recognizes that the Lafon Orchard is the last remaining site of an apple orchard at Manzanar NHS. The CLR recommends that *“pending the development of the OMP, the Comprehensive Interpretive Plan, and an adequate water distribution network, the full extent of the orchard within the context of the camp should be re-established.”*

Re-establishment of the Lafon Orchard to reflect its appearance during the War Relocation Center Period involves some conjecture, as the exact number, location and species of fruit trees are unknown. The most useful historical documentation of the orchard during camp conditions is a 1944 aerial photograph, which clearly indicates the orchard as a remnant rather than as a complete grid of trees. In the historic aerial photograph, the Lafon fruit trees appear in a stair-stepped grid pattern, with gaps in the grid due to the presence of barracks blocks. In order to depict the Lafon Orchard, the treatment “rehabilitation” is selected, as it allows for compatible additions and alterations to the existing conditions, to depict an orchard that is consistent with the historic period, if not exactly the same.

The Lafon Orchard Rehabilitation Plan involves the planting of new apple trees and preservation of four of the five extant fruit trees (two apple and two Comice pear trees). One rootstock sprout pear tree may be removed. See the following Lafon Orchard Rehabilitation Site Plan for new tree locations. Rehabilitation recommendations follow:

- Propagate new apple trees from the extant scionwood of apple tree LF-6-A and extant seedling rootstock from a sprout of either surviving apple tree in the Lafon Orchard. Fourteen apple trees are needed, however propagation should factor in additional trees to allow for some mortality after planting (see “Propagation” in the Preservation Maintenance chapter for more information).
- Erect a temporary, 10-year fence around the Lafon Orchard, as indicated in the Fencing Plan in the Preservation Maintenance Chapter. Follow the guidelines for fence design, to render the fence compatible with the historic character of the cultural landscape.
- Plant 14 custom-propagated apple trees in the Lafon Orchard, as indicated on the Lafon Orchard Treatment Site Plan. The trees should have scionwood grafted to seedling rootstock that is derived from the historic Lafon apple trees. The graft unions should be located just above ground level when the trees are planted. Follow the instructions in “Planting New and Replacement Trees” in the Preservation Maintenance chapter. The new tree spacing should be 30 feet by 30 feet.
- Develop the new apple trees into low-headed trees, with a short trunk and an open-bowl pruning style. “See Pruning Young Trees” in the Preservation Maintenance chapter.

- Irrigate the trees by hand-watering or using a newly installed subterranean irrigation system. See “Irrigating” in the Preservation Maintenance chapter, for more information.
- Preserve through preservation maintenance, including replacement-in-kind, the old and new trees of the rehabilitated orchard. After removal of the rootstock sprout tree LF-11-P, the total number of trees post-rehabilitation will be 18.



**LAFON ORCHARD
REHABILITATION PLAN**

Lydston Orchard Treatment Plan: Restoration

Prior treatment guidance provided by the CLR recognizes that the Lydston Orchard is one of the most intact historic pear orchards in the park. The CLR emphasizes the preservation of the existing trees, but also indicates permanent fencing may be appropriate for protection of the whole orchard, due to its location away from the auto tour route.

The OMP treatment plan builds upon the recommendations of the CLR, prescribing restoration of the orchard by in-filling the gaps of missing trees that were present during the camp and town era periods. The Lydston Orchard Restoration Plan involves the planting of 40 new Comice pear trees and the preservation of 16 historic Comice trees. In addition, another eight rootstock sprout trees should be eventually replaced with Comice trees. See the following Lydston Orchard Restoration Site Plan for tree layout. Restoration recommendations follow:

- Propagate new Comice trees from the extant scionwood of Comice trees and extant seedling rootstock from sprouts of pear trees in the Lydston Orchard. Forty Comice trees are needed, however propagation should factor in additional trees to allow for some mortality after planting (see “Propagation” in the Preservation Maintenance chapter for more information).

- Erect a temporary, 10-year fence around the Lydston Orchard, as indicated in the Fencing Plan in the Preservation Maintenance Chapter. Follow the guidelines for fence design, to render the fence compatible with the historic character of the cultural landscape.

- Plant 40 custom-propagated apple trees in the Lydston Orchard, as indicated on the Lydston Orchard Restoration Site Plan. The trees should have scionwood grafted to seedling rootstock that is derived from the historic Lydston pear trees. The graft unions should be located just above ground level when the trees are planted. Follow the instructions in “Planting New and Replacement Trees” in the Preservation Maintenance chapter. The tree spacing should be 15 feet by 24 feet, in five rows oriented approximately east to west.

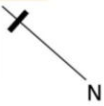
- Develop the new Comice trees into low-headed trees, with a short trunk and an open-bowl pruning style. “See Pruning Young Trees” in the Preservation Maintenance chapter for more information.

- Remove the eight rootstock sprout trees: LY-1-P, LY-1-14, LY-16-P, LY-31-P, LY-1-39, LY-43-P, LY-50-P, and LY-53-P and replace with Comice replacement trees, following the same propagation techniques as with the first 40 new Comice trees.

- Preserve through preservation maintenance, including replacement-in-kind, the old and new trees of the rehabilitated orchard. Post-restoration, the total number of trees will be 64.



	PEAR (var. Comice)		NEW PEAR TREE
	PEAR (rootstock sprout Quince)		CAMP BLOCK NUMBER



**LYDSTON ORCHARD
RESTORATION PLAN**

Wilder Orchard Treatment Plan: Restoration

Prior treatment guidance provided by the CLR recognizes that the Wilder Orchard is one of the most intact historic pear orchards in the park. The CLR emphasizes the preservation of the existing trees, particularly the Winter Nellis rootstock that is unique to the Wilder Orchard.

The OMP treatment plan builds upon the recommendations of the CLR, prescribing restoration of the orchard by in-filling the gaps of missing trees that were present during the camp period. The Wilder Orchard Restoration Plan involves the planting of 221 new Bartlett pear trees and the preservation of 32 historic Bartlett trees and seven historic Comice trees. In addition, another 19 rootstock sprout trees should be eventually replaced with 17 Bartlett and 2 Comice trees. See the following Wilder Orchard Restoration Site Plan for tree layout. Restoration recommendations follow:

- Propagate new Bartlett trees from the extant scionwood of Bartlett trees in the Wilder Orchard. Seedling rootstocks should be derived from the rootstock sprouts of Wilder pear trees, including the Winter Nellis rootstock trees: 6F-1-18 and B29-1-4. Two hundred and twenty one Bartlett trees are needed, however propagation should factor in additional trees to allow for some mortality after planting (see “Propagation” in the Preservation Maintenance chapter for more information).

- Erect a temporary, 10-year fence around the Wilder Orchard, as indicated in the Fencing Plan in the Preservation Maintenance Chapter. Follow the guidelines for fence design, to render the fence compatible with the historic character of the cultural landscape.

- Plant 221 custom-propagated apple trees in the Wilder Orchard, as indicated on the Wilder Orchard Restoration Site Plan. The trees should have scionwood grafted to seedling rootstock that is derived from the historic Bartlett trees. The graft unions should be located just above ground level when the trees are planted. Follow the instructions in “Planting New and Replacement Trees” in the Preservation Maintenance chapter. The tree spacing should be 15 feet by 30 feet, in 11 rows oriented approximately east to west.

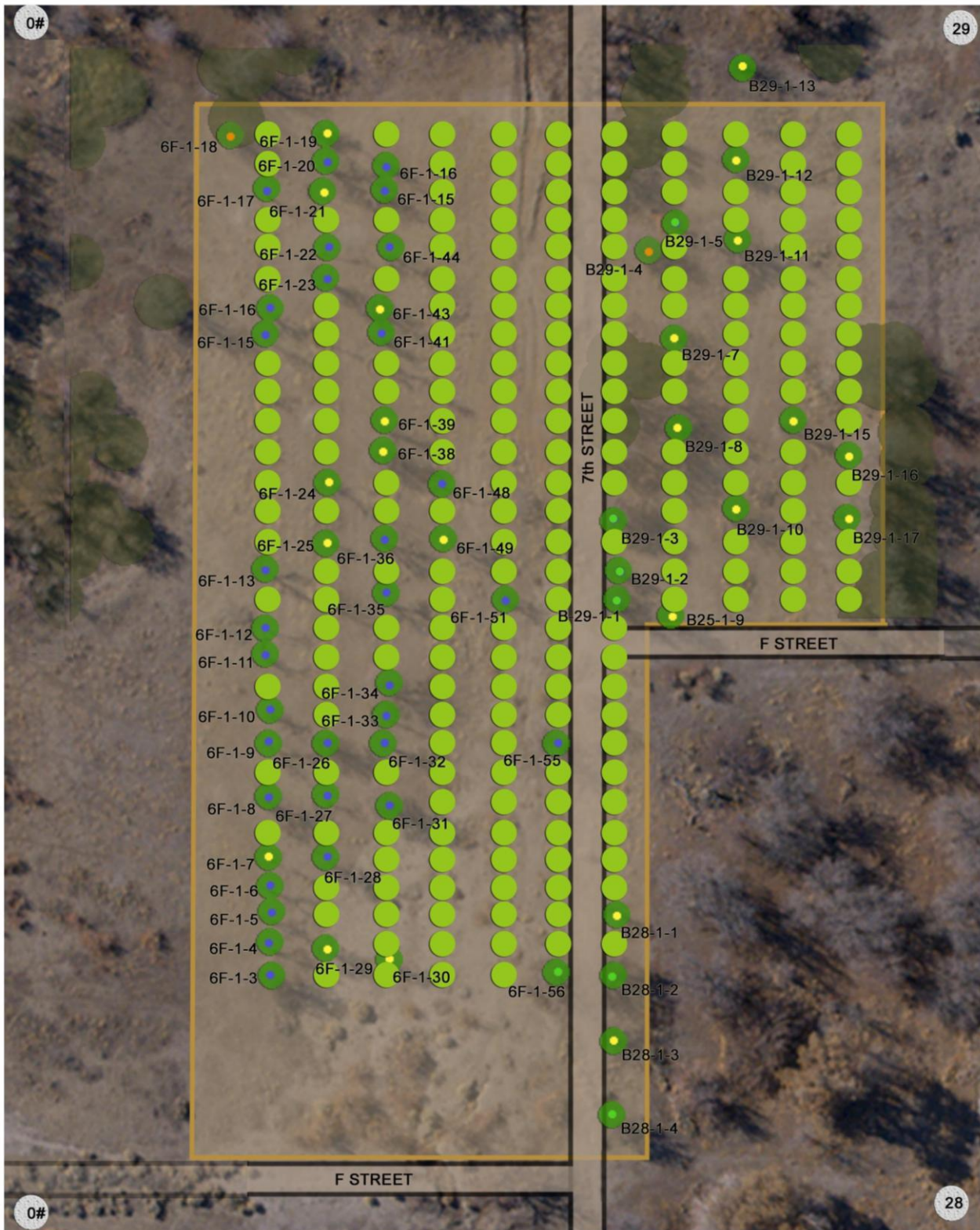
- Develop the new Bartlett trees into low-headed trees, with a short trunk and an open-bowl pruning style. “See Pruning Young Trees” in the Preservation Maintenance chapter for more information.

- Remove three rootstock sprout trees: 6F-1-30, B29-1-4, and B29-1-9. These trees have sprouted between the historic rows of trees and should not be replaced. All of the other rootstock sprout trees indicated on the Wilder Restoration Site Plan should be removed and replaced with Bartlett replacement trees, following the same propagation techniques as with the first 221

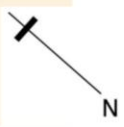
new Bartlett trees. Two rootstock sprout trees are exceptions, however, and these should be removed and replaced with Comice rather than Bartlett variety, due to their proximity to historic Comice trees (i.e., these trees would have been Comice variety during the camp period). These two rootstock sprout trees: B28-1-1 and B28-1-3 should be replaced with Comice trees, with scionwood derived from the adjacent historic Comice trees B28-1-2 and B28-1-4.

- Expand the existing subterranean irrigation system to supply the new trees of the restored orchard.

- Preserve through preservation maintenance, including replacement-in-kind, the old and new trees of the rehabilitated orchard. Post-restoration, the total number of trees will be 276.



- PEAR (var. Bartlett)
- PEAR (rootstock sprout Quince)
- PEAR (var. Comice)
- PEAR (rootstock sprout Winter Nellis)
- NEW PEAR TREE
- # BLOCK NUMBERS



**WILDER ORCHARD
RESTORATION PLAN**

Wilder North Orchard Treatment Plan: Rehabilitation

Prior treatment guidance provided by the CLR acknowledges that the Wilder North Orchard is highly visible along the auto tour route and recommends that the Wilder North Orchard be rehabilitated for interpretive purposes. (Note the Wilder North Orchard is referred to as the “Hatfield West” in the CLR.)

A 1944 aerial photograph clearly shows the Wilder North Orchard as a complete grid of trees in Block 34, i.e., north of Merritt Park, but as a remnant between residential barracks in Block 33. Today, the majority of surviving fruit trees are located in Block 33, and only two trees survive in Block 34. The OMP Treatment Plan proposes to build upon the opportune absence of historic fruit trees in Block 34 and the visibility of this block to the auto tour route, to establish a new orchard of apple trees, demonstrating the varieties known to have been grown both on site and in the vicinity, during the Manzanar Town Era and the War Relocation Center Period. In order to depict the Wilder North Orchard with apple trees rather than pears (as they were historically), the treatment “rehabilitation” is selected, as it allows for compatible additions and alterations to the Wilder North Orchard, to depict an orchard that is consistent with the historic period, if not exactly the same. The primary goal in rehabilitating the Wilder North Orchard with apple trees is to interpret the local apple history of the Town of Manzanar, and represent the apple varieties present during the camp period that are no longer extant on the site.

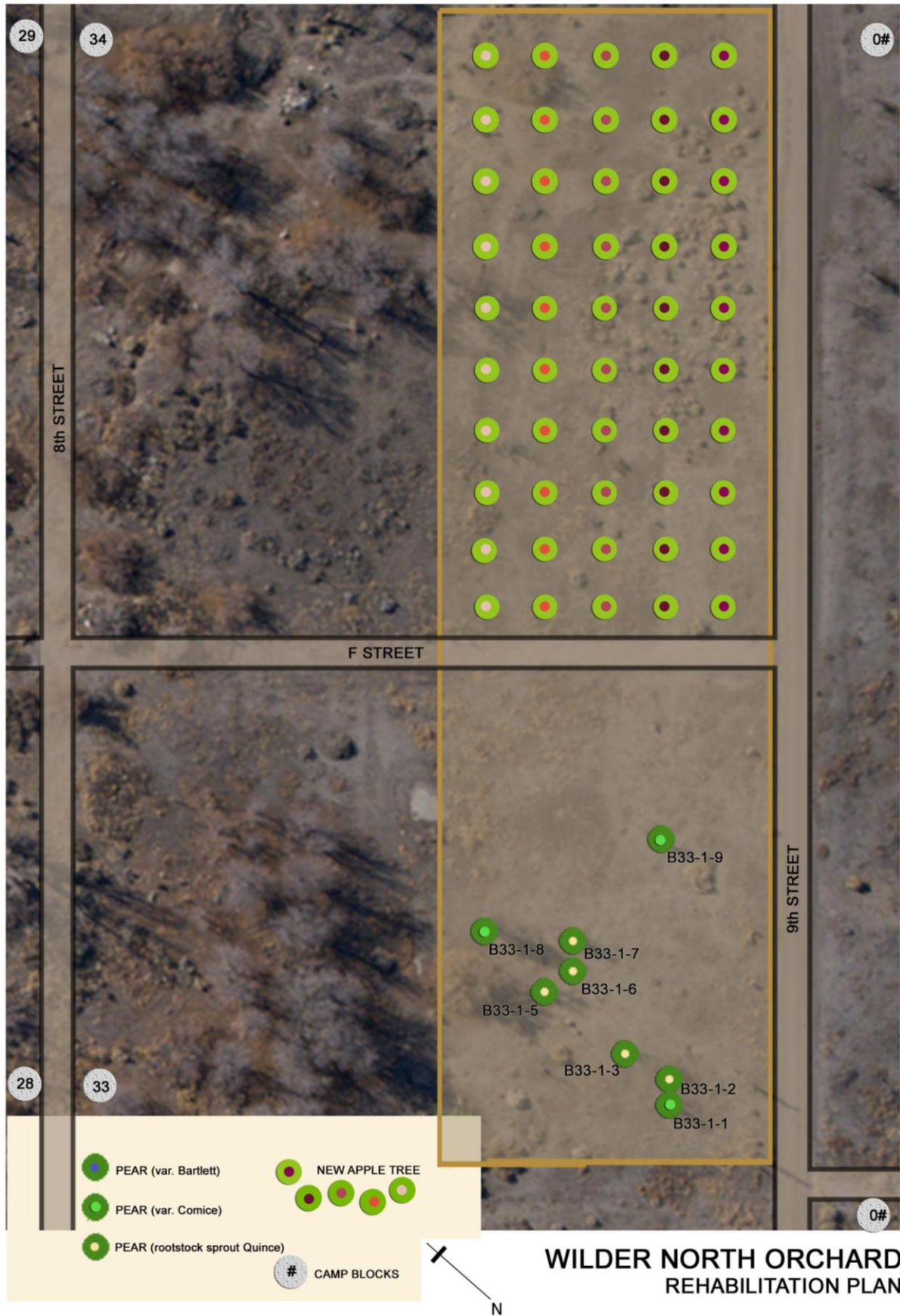
The Wilder North Orchard Rehabilitation Plan involves the planting of new apple trees and preservation of three of the ten extant fruit trees (three Comice pear trees). Six rootstock sprout pear trees and one variety tree may be removed. See the following Wilder North Orchard Rehabilitation Site Plan for new tree locations. Rehabilitation recommendations follow:

- Propagate new apple trees representing the three varieties that are documented to have been grown in the War Relocation Center: Newtown Pippin, Winesap, and Yellow Belleflower apples, and another two of the varieties known to be grown in the agricultural colony of Manzanar: Esopus Spitzenburg, and Arkansas Black. The scionwood should be obtained from the National Clonal Germplasm Repository in Geneva, New York or from a qualified commercial nursery source. The scionwood should consist of the original early 1900s variety, not a modern strain of the variety. Fifty apple trees are needed; however propagation should factor in additional trees to allow for some mortality after planting (see “Propagation” in the Preservation Maintenance chapter for more information). The trees should be planted out in rows by variety, as indicated on the rehabilitation plan.

- Erect a temporary, 10-year fence around the Wilder North Orchard, as indicated in the Fencing Plan in the Preservation Maintenance Chapter. Follow the guidelines for fence design, to render the fence compatible with the historic character of the cultural landscape.

- Plant 50 custom-propagated apple trees in Block 34 of the Wilder North Orchard, as indicated on the Wilder North Orchard Treatment Site Plan. The trees should have scionwood grafted to seedling rootstock that is derived from the historic Lafon apple trees. The graft unions should be located just above ground level when the trees are planted. Follow the instructions in “Planting New and Replacement Trees” in the Preservation Maintenance chapter. New tree spacing should be 30 feet by 30 feet, reflecting the historic spacing of apple orchards at Manzanar.
- Develop the new apple trees into low-headed trees, with a short trunk and an open-bowl pruning style. “See Pruning Young Trees” in the Preservation Maintenance chapter for more information.
- Remove six rootstock sprout trees: B33-1-2, B33-1-3, B33-1-5, B33-1-6, B33-1-7 and B33-1-11. These trees are not historically accurate trees and should not be replaced. One historic Bartlett tree: B33-1-10 should be removed and not replaced, to make room for the new apple orchard. This tree is in extremely poor condition.
- Irrigate the trees by expanding the subterranean irrigation system. See “Irrigating” in the Preservation Maintenance chapter, for more information.
- Preserve through preservation maintenance, including replacement-in-kind, the old and new trees of the rehabilitated orchard. After removal of the rootstock sprout trees, three variety trees will remain in Block 33: B33-1-1. B33-1-8 and B33-

1-9. These historic trees may need to be replaced in-kind as they reach mortality. Post-rehabilitation the total number of trees in the Wilder North Orchard will be 53.



**WILDER NORTH ORCHARD
REHABILITATION PLAN**

Cemetery (Christopher) Orchard Treatment Plan: Rehabilitation

During the Manzanar War Relocation Center Period, the cemetery was developed on the site of the Christopher Orchard, containing peach trees. The treatment plan for the Cemetery (Christopher) Orchard, provided by the CLR: *“Reestablish the missing Black locust and peach trees within the cemetery boundary that can be documented from historic photos as part of the historic setting for the site. Emphasis should be on restoring the character of the peach trees, not on fruit production. An emphasis should be placed on using stock that minimizes the need for pest and irrigation management. Use of existing on-site peach tree stock should be considered because of their ability to survive under duress. Any fencing installed to protect these trees should be temporary in nature until the trees are of sufficient height and stature to survive without protection from wildlife.”*

Rehabilitation recommendations follow:

- Propagate seedling peach trees from cuttings of the seedling peach trees located in Blocks 14 and 29. These are ungrafted trees and are very hardy compared to peach variety trees. Six peach trees are needed; however propagation should factor in additional trees to allow for some mortality after planting (see “Propagation” in the Preservation Maintenance chapter for more information).
- Plant six custom-propagated peach trees in the cemetery, as indicated on the following site plan, after archeological testing and monitoring during planting. The trees are ungrafted, and

therefore have no graft unions. Follow the instructions in “Planting Replacement Trees” in the Preservation Maintenance chapter. The new tree spacing is irregular, as shown on the site plan, reflecting the historic spacing of peach trees in the cemetery during the War Relocation Center Period.

- Develop the new peach trees into low-headed trees, with a short trunk and an open-bowl pruning style. “See Pruning Young Trees” in the Preservation Maintenance chapter for more information. The tree root zones may be delineated with granite boulder edging, to resist soil compaction during public gatherings.
- Protect the new trees from elk browsing by spraying with the chemical repellent “Liquid Fence” or equivalent. Weekly re-applications will be needed, but this will avoid the erection of fencing in this visually sensitive area.
- Irrigate the trees by hand watering.
- Preserve through preservation maintenance, including replacement-in-kind, the new trees of the rehabilitated Cemetery (Christopher) Orchard. Post-rehabilitation, the total number of fruit trees in the Cemetery (Christopher) Orchard will be six. However, an additional five Black locust trees are called for in the CLR treatment plan. Refer to the CLR for more details.

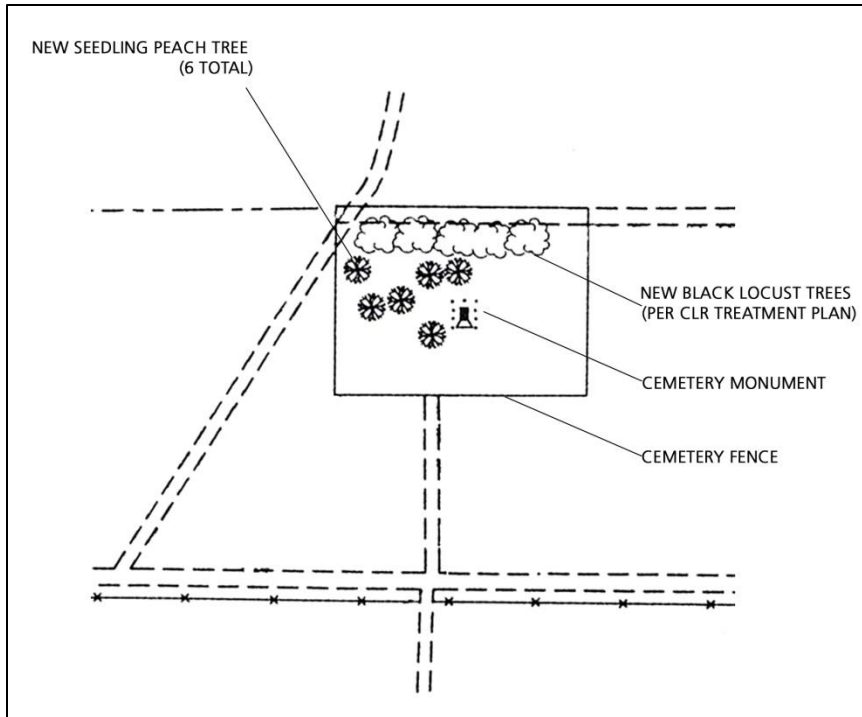


Figure 55: Cemetery (Christopher) Orchard Rehabilitation Treatment Plan (source: NPS PWRO Cultural Landscape Report, 2006).

Outlying Fruit Tree Treatment: Preservation

The treatment selected for the historic outlying fruit trees is preservation. Non-historic fruit trees were not part of the landscape during the War Relocation Center Period, and may be removed. A summary table identifies the outlying fruit trees to be preserved or removed.

Preservation of Historic Outlying Fruit Trees

Outlying fruit trees to be preserved should receive ongoing preservation maintenance activities, as identified in the “Orchard Management” chapter, including replacement in-kind, when these trees deteriorate beyond the point of rejuvenation. As these trees reach a declining state, potentially due to natural mortality, the trees should be propagated (including scion and rootstock material), so that accurate in-kind replacement trees can be created. Replanting will involve removal of the dead or severely declining tree after propagation, stump grinding (with archeological monitoring) and planting of the replacement tree in the same location, to the greatest extent possible.

Removal of Non-Historic Outlying Fruit Trees

Non-historic outlying trees may be removed to more accurately depict the appearance of the landscape during the camp period. Removal should involve the flush-cutting of the trunk as low as possible (so that a

stump is not visible) and poisoning of the stump with copper nails, to prevent re-sprouting. Trees to be removed but with germplasm unique to the site, namely the Asian pear and apricot trees, should have their germplasm conserved and potentially used to propagate new trees for the reconstruction of residential block gardens. During the War Relocation Center Period, the residential block gardens contained a diversity of plant species, and Asian pear, apricot, peach and fig trees are suitable plant materials for the recreated gardens. The germplasm may also be conserved in-situ (by allowing these trees to remain in place for purely germplasm conservation purposes).

Hatfield Orchard Remnant Treatment					
Tree No.	Species	Variety	Other	Historic /Non Historic	Treatment
P13-1-1	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-2	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-3	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-4	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-5	Asian Pear	N/A	Rootstock	Non Historic	May be removed, but germplasm should be conserved
P13-1-6	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-7	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-8	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-9	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-10	Pear	N/A	Rootstock	Non Historic	May be removed
P13-1-11	Pear	N/A	Rootstock	Non Historic	May be removed

Outlying Fruit Tree Treatment (contd.)					
Tree No.	Species	Variety	Other	Historic/ Non Historic	Treatment
Block 12					
B12-1-1	Fig	Unknown	N/A	Historic	Preserve
B12-1-2	Fig	Unknown	N/A	Historic	Preserve
B12-1-3	Fig	Unknown	N/A	Historic	Preserve
Victory Garden Near Block 12					
B12-1-4	Apricot	N/A	Rootstock	Non Historic	May be removed, but germplasm should be conserved
Block 28					
B28-1-5	Pear	Comice	N/A	Historic	Preserve
B28-1-6	Pear	N/A	Rootstock	Non Historic	May be removed
Block 22					
B22-1-1	Pear	N/A	Rootstock	Non Historic	May be removed
Children's Village					
CV-1-1	Pear	Bartlett	N/A	Historic	Preserve
6F-1-54	Pear	N/A	Rootstock	Non Historic	May be removed
Block 29					
B29-1-1	Peach	N/A	Rootstock	Non Historic	Preserve
B29-1-2	Peach	N/A	Rootstock	Non Historic	Preserve
Block 14					
B14-1-1	Peach	N/A	Rootstock	Non Historic	Preserve
B14-1-2	Peach	N/A	Rootstock	Non Historic	Preserve
Hospital Complex					
HC-1-1	Pear	N/A	Rootstock	Non Historic	May be removed

Historical Overview

Introduction

Manzanar National Historic Site is located in the Owens Valley in Inyo County, California. Situated in east-central California, the valley is oriented in a north-south direction and is approximately 120 miles long and 16 miles wide. The Sierra Nevada range bounds the Owens Valley to the west and the White-Inyo Mountains form the eastern boundary. Within the valley, Manzanar is located at approximately 4,000 feet of elevation at the eastern base of the Sierra Nevada. The valley is located in the Sierra Nevada rain shadow and receives approximately five to six inches of rainfall per year, although precipitation is variable from year to year.⁹ During the spring and summer months there is a significant amount of runoff from the melting Sierra Nevada snow pack, which flows into the valley and replenishes groundwater aquifers. As a result of these processes, the groundwater table on the valley floor is generally high.¹⁰ Classified as a high desert environment, vegetation in the valley consists of Great Basin and Mohave Desert shrub communities. Cattle grazing and limited agriculture in the form of alfalfa production occur in the area, while Tule elk roam lands owned by the Los Angeles Department of Water and Power, Bureau of Land Management and the U.S. Forest Service.

⁹ Heather E. Johnson, Vernon C. Bleich, Paul R. Krausman, "Antler Breakage in Tule Elk, Owens Valley, California," *The Journal of Wildlife Management* 69, no. 4 (Oct., 2005): 1748.

¹⁰ Andrew J. Elmore, John F. Mustard, Sara J. Manning, "Regional Patterns of Plant Community Response to Changes in Water: Owens Valley, California," *Ecological Applications* 13, no. 2 (Apr., 2003): 443-445.

Settlement of the region began with early American Indian occupation and later with the Owens Valley Paiute establishing settlements in the locale. In the 1860s, the area was explored by Euro-American ranchers as well as miners seeking mineral wealth. A period of ranching and settlement ensued, followed by agricultural development in which settlers sought to take advantage of the abundant stream flow from the Sierra Nevada. In 1905, the Los Angeles Department of Water and Power began acquiring water rights in the valley. In early 1910s, the Owens Valley Improvement Company (OVIC) purchased 3,000 acres in the valley and established an agricultural community named “Manzanar,” which is Spanish for “apple orchard”.

Land buyouts continued in the 1920s as Los Angeles continued acquiring land in the valley in an effort to divert the surplus flow of the Owens River to the city to support its rapidly growing population.¹¹ Additional water diversions and property buyouts led to the abandonment of rural settlement as farmers began to leave the valley. Soon the city of Los Angeles began bulldozing abandoned farmhouses and remnant vestiges of the once lucrative agricultural community. In 1934, Los Angeles cut off irrigation and the few remaining fruit orchards and grain and alfalfa fields were inundated by desert scrub. These agricultural areas were largely neglected until 1942 when the War Relocation Authority (WRA) established an internment camp at the site. During occupation of the camp, many talented Japanese American orchardists brought the neglected fruit trees back to life, harvesting the abundant fruit crops for use and enjoyment by those at the camp. The Manzanar War Relocation

¹¹ Robert A. Sauder, “Patenting an Arid Frontier: Use and Abuse of the Public Land Laws in Owens Valley,” *Annals of the Association of American Geographers* 79, no. 4 (Dec., 1989): 545. It should be noted that according to Sauder, the communal Mormon settlements located in the eastern Great Basin are also examples of some of the earliest attempts to colonize the arid West.

Center was open from 1942 until 1945 when the camp was closed. After the camp was closed, many of the buildings were removed and the fruit trees were once again abandoned and fell into neglect. The National Park Service acquired the property in 1997 and established Manzanar National Historic Site.

Prehistory

Manzanar is located within the Great Basin Culture area, which includes portions of California, Oregon, Utah, Nevada, and Colorado situated between the Sierra Nevada and the Rocky Mountains.¹² Within this area, evidence of the first cultural sequence stretches back at least 12,000 years. The earliest group of people to occupy the area was the Paleo-Indians (12,000-9000 BC) who moved across the landscape in small mobile groups and hunted large fauna. Later, people of the Great Basin Desert Archaic (9,000 BC-AD 500) occupied the area, utilizing a broader subsistence base, while during the Fremont (AD 500-1300) period there were sedentary villages that were supported by horticulture coupled with hunting and gathering. Between AD 600 and AD 1000 population increases occurred in the Owens Valley as a result of the exploitation of regional alpine ecological niches.¹³

As early Euro-American explorers entered the Owens Valley in the early 19th century, they encountered the Owens Valley Paiute. Their territory

¹² 1996 General Management Plan and Environmental Impact Statement: Manzanar National Historic Site, Inyo County California (California: United States Department of the Interior, National Park Service, 1996), 38.

¹³ Ibid.

was a vast stretch that extended from the Sierra Nevada Mountains to the west, east to the Inyo Mountains, south to Owens Lake and north to the pine forests of Long Valley. The Owens Valley Paiute maintained year round villages near streams flowing from the Sierra Nevada, and also traveled to temporary camps through the year to collect food resources such as pinion nuts and hunt game. In addition to hunting and gathering, the Paiutes also practiced a form of irrigated agriculture to enlarge the growth of natural meadows found at the edge of the valley floor.¹⁴ The Paiute did not till or plant the soil, rather they “cleverly watched how nature waters the grasses and bulbs, then followed suit”. Essentially they practiced irrigation with agriculture through “intensifying by irrigation what nature had already provided”.¹⁵

Euro-American Explorations and Early Settlements: 1829-1902

Euro-American exploration of eastern California was initially spurred by the fur trade. The earliest record of exploration was by Peter Skene Ogden, a Hudson’s Bay Company trapper, who entered the area in 1829-1830. A couple of years later, in 1834, Captain Joseph Reddeford Walker crossed through the Owens Valley while leading a beaver trapping expedition. In the years following, Walker traveled through the Owens Valley on several occasions with such companions as photographer and topographer, Edward M. Kern.¹⁶ In 1848, the Owens Valley was

¹⁴ *Cultural Landscape Report: Manzanar National Historic Site*, (Seattle: United States Department of the Interior, National Park Service, Pacific West Region, 2006), 8.

¹⁵ Robert A. Sauder, “The Agricultural Colonization of a Great Basin Frontier: Economic Organization and Environmental Alteration in Owens Valley, California, 1860-1925,” *Agricultural History* 64, no. 4 (Autumn, 1990): 80.

¹⁶ *Cultural Landscape Report: Manzanar National Historic Site*, 9.

included into the public domain as a result of the Mexican land cession. The first systematic evaluation and survey of the Owens Valley was made by A.W. Von Schmidt between 1855 and 1856. Three years later, in 1859, Captain J.W. Davidson was sent from Fort Tejon to the Owens Valley to “examine the country well with reference to its fitness for the purpose of an Indian reservation” as well as to report on “the agricultural, timber and water resources”.¹⁷ As part of Davidson’s assessment he speculated that the Owens Valley was well-suited to the production of wheat, barley, oats, rye, and fruit such as apples and pears: “To the Grazier, this is one of the finest parts of the state; to the Farmer, it offers every advantage but a market”. Ultimately, Davidson’s speculation in regard to the agricultural productivity of the region was relatively accurate.¹⁸

As the mines located in the western Sierra Nevada began to diminish, the discovery of gold and silver in the eastern Sierra Nevada and Inyo Mountains attracted a plethora of prospectors to the Owens Valley as early as 1860. After the prospectors arrived many Euro-American ranchers followed, entering the area in 1861 in search of grazing opportunities for their cattle. Significantly, in 1862, John Shepherd homesteaded 160 acres of land three miles north of Georges Creek on the future site of Manzanar.¹⁹ As the Euro-American population in the area began to quickly increase, tensions between the settlers and Paiute came to a head between 1861 and 1862 when they were engaged in an open conflict. In order to resolve the conflict, the military became involved and in 1863, they forcibly removed 1,000 Paiute people to Fort Tejon, located south of Bakersfield, California. The removal of the Paiute allowed the Euro-American population to become a more

¹⁷ Cultural Landscape Report: Manzanar National Historic Site, 10.

¹⁸ Robert A. Sauder, *The Lost Frontier: Water Diversion in the Growth and Destruction of Owens Valley Agriculture* (Tucson: University of Arizona Press, 1994), 25-27.

¹⁹ Cultural Landscape Report: Manzanar National Historic Site, 14.

permanent community of settlers characterized by a small-farm, mixed agricultural complex that was built to serve local mines.²⁰ Eventually, many of the Paiute left Fort Tejon and returned to the Owens Valley where they provided a labor force that supported the growth of the agricultural economy in the valley.²¹

As early ranchers and homesteaders settled the Owens Valley, the demand for farm products in the region increased. In the 1870s most of the prime bottomland areas were being utilized by farmers engaged in sheep-raising as well as in the production of a number of other products including, butter, eggs, poultry, potatoes, orchard and market garden produce, and honey.²² At this time, the Big Pine area was the valley's largest fruit producer—largely because an Owens Valley's pioneer orchardist had settled there.²³ By 1877, there was a decline in the price of silver and many local mines went into decline. Consequently, Camp Independence, which served as a local market for surplus farm products, ceased operations.²⁴ The last two decades of the 19th century in the Owens Valley were characterized by a continuation of the economic conditions that had emerged in the late 1870s. Without the means to ship surplus agricultural products to markets outside the valley, the farmers were unable to financially carry on and many left the area. Relief came in the summer of 1883 when a narrow-gauge rail service was provided by the Carson and Colorado Railroad. While the new rail line did slightly increase the beef market, it had only a minimal effect on the declining agricultural economy due to a number of factors, including high shipping

²⁰ Sauder, "Patenting an Arid Frontier," 551-552.

²¹ Sauder, "The Agricultural Colonization of a Great Basin Frontier," 86.

²² Andrew J. Elmore, John F. Mustard, Steven P. Hamburg, Sara J. Manning, "Agricultural Legacies in the Great Basin Alter Vegetation Cover, Composition, and Response to Precipitation," *Ecosystems* 9, no. 8 (Dec., 2006): 1233.

²³ Sauder, "The Lost Frontier," 69.

²⁴ *Ibid.*

costs and distance from the transcontinental Central Pacific Railroad at Reno, Nevada.²⁵

Unable to free themselves from high freight rates to distant West Coast markets, farmers in the Owens Valley began to stray away from the mixed farming system that initially characterized the valley in favor of stock-raising. As a result of the increase in animal husbandry, farms grew larger, forcing small farms less than 100 acres out. The trend toward bigger farms was not endorsed by all groups, including staff at the local newspaper who recommended growing fruit as an alternative to stock-raising. While apples, peaches, pears, apricots, nectarines, plums and cherries were grown on ranches in the valley at this time, their demand had not exceeded the local level and late spring frosts, a common occurrence in the valley, were a drawback to the expansion fruit growing in the locale.²⁶

By 1900, approximately 30 percent of the farms in the valley were less than 100 acres in size, with the majority of these farms fewer than 50 acres. During this period, irrigation works in the Owens Valley were expanding and there was a trend toward smaller farms in the northern end of the valley near Bishop. This trend tempted some farmers and ranchers to reconsider stock-raising and experiment with fruit production, dairying, and poultry-raising. According to Sauder, “perhaps the most striking change at the turn of the century is reflected in the number fruit trees planted during the previous decade, along with the expansion of milk, egg, and honey production. The value of market garden and orchard products, rising from approximately \$2,000 to over

²⁵ Ibid, 75-77.

²⁶ Sauder, “The Agricultural Colonization of a Great Basin Frontier,” 96.

\$27,000, also reflects the valley's new economic fortune".²⁷ Despite the interest in experimenting with different types of farming, the overall tendency toward larger farms continued through the first decade of the 20th century, but at a slower pace than previous decades.²⁸

Water Reclamation and the Development of Agriculture in the Owens Valley: 1902-1941

In 1902, the Newland Reclamation Act created the U.S. Reclamation Service, which provided for the irrigation and reclamation of undeveloped lands by constructing dams, channels, and flood control systems throughout the arid West.²⁹ One year later, in 1903, the Pacific Coast region supervising engineer of the Reclamation Service, Joseph B. Lippincott, selected Jacob Clausen to conduct a survey of the Owens Valley in order to document the unpatented lands and to assess the possibility of storing water for reclamation. After the survey had been completed, Clausen was directed to provide the survey data to the city of Los Angeles. Consequently, Chief engineer of the Los Angeles Bureau of Water Works and Supply, William Mulholland, assured the Reclamation Service that any water development project would be a municipal undertaking.³⁰ Clausen's survey resulted in the withdrawal of nearly half a million acres from homestead claims in the valley. The majority of the withdrawals were located along the Sierra *bajada* and on slopes where irrigation systems had not been established.

²⁷ Sauder, "The Lost Frontier," 98-99.

²⁸ Sauder, "The Agricultural Colonization of a Great Basin Frontier," 98-99.

²⁹ Cultural Landscape Report: Manzanar National Historic Site, 15.

³⁰ *Ibid*, 17.

Working with Los Angeles Mayor Fred Eaton, Mulholland developed a plan to build a gravity-fed aqueduct system that would transport water from the eastern Sierra Nevada Mountains to Los Angeles. In 1905, the aqueduct plan was supported by the citizens who voted on a \$1.5 million bond issue to purchase Owens Valley lands and water rights. When news broke on the construction of the aqueduct, the *Inyo Register* posted the following headline: “Los Angeles Plots Destruction—Would Take Owens River, Lay Lands Waste, Ruin People, Homes and Communities”.³¹ Within the year, Los Angeles began acquiring land and water rights in the Owens Valley. Two years later, in 1907 Los Angeles voters approved a \$23 million bond for construction of a 233-mile long aqueduct and the U.S Reclamation Service withdrew from the Owens Valley Project.³²

By 1909, Los Angeles had acquired over 82,000 acres of land and water rights, which included almost the entire southern half of the valley and also some acreage in the northern end.³³ The land was primarily located in the valley’s central and southern townships—leaving the northern townships wholly untouched with only minor exceptions.³⁴ In 1913, the aqueduct was completed, which diverted surplus water from the Owens River south to support the expanding city of Los Angeles. When the surplus water from the Owens River spilled into the aqueduct in 1913, its flow exceeded the contemporary domestic needs of Los Angeles by about four times.³⁵ After the aqueduct was completed, Owens Valley residents were faced with an uneasy coexistence with Los Angeles. While the diversion of the Owens River’s surplus flow affected existing

³¹ Sauder, “The Lost Frontier,” 112-114.

³² Los Angeles Department of Power and Water (LADWP), “History of Water and Power in LA” <www.ladwp.com> February 8, 2010.

³³ Sauder, “The Lost Frontier,” 116.

³⁴ Sauder, “Patenting an Arid Frontier,” 565-566.

³⁵ Sauder, “The Lost Frontier,” 122.

agriculture in the valley to a limited extent (since most farming was located north of the diversion site), future agricultural developments were largely restricted to the northern end of the valley where “appropriative rights senior to those of Los Angeles prevailed”.³⁶ As a result, croplands dominated the northern parts of the valley, near the town of Bishop, while livestock grazing occurred across the remaining segments of the valley.³⁷

As Los Angeles acquired land throughout the first two decades of the 20th century, agriculture continued to develop and expand in the valley. Between 1900 and 1910 the number of farms remained relatively constant, while between 1910 and 1920 the number of farms increased slightly and the irrigated acreage of farmland rose from 41,000 to 65,000 acres. In 1910, approximately 43 percent of farms in the Owens Valley were less than 100 acres in size. Local newspapers considered the trend toward smaller, more intensive, specialized farming to be a positive sign for the valley’s future and encouraged the process. In many ways, the intensification of agriculture in the Owens Valley was a response to the development of irrigation in the northern townships. Furthermore, this process may have also accelerated as a result of the completion of a standard-gauge rail line linking the Owens Valley with Los Angeles in 1910.³⁸ By 1922, the agricultural future of the Owens Valley appeared to be bright; however, optimism began to fade away as the valley’s farmers encountered the effects of a drought that plagued the region for several years. At this time, the runoff from the Sierra Nevada Mountains was well below normal, and after local agriculturalists diverted water for irrigation there was little water left to supply the aqueduct. During the

³⁶ Ibid, 125.

³⁷ John Walton, *Western Times and Water Wars: State, Culture, and Rebellion in California* (Berkeley: University of California Press, 1993), 139-140.

³⁸ Sauder, “The Lost Frontier,” 125-128.

summer of 1923 the drought situation reached crisis proportions in Los Angeles.³⁹

Inyo County Orchard Yield, 1900 - 1940							
Co.	Year	No. of Apple Trees Bearing	Quantity of Apples Harvested	No. of Apple Trees Not Bearing	No. of Pear Trees Bearing	Quantity of Pears Harvested	No. of Pear Trees Not Bearing
Inyo	1900	28,571	6,413 Bushels	N/A	3,319	893 Bushels	N/A
Inyo	1910	19,611	35,430 Bushels	N/A	2,668	2,676 Bushels	N/A
Inyo	1920	18,737	16,728 Bushels	18737	3,405	3,198 Bushels	6,369
Inyo	1930	26,837	226 tons	81	4,136	42 tons	5
Inyo	1940	3,008	333 tons	1,129	161	28 tons	12

Figure 56: Table showing agricultural census information for Inyo County from 1900 to 1940.

Also in 1922, the city of Los Angeles began to purchase lands and water rights within the community of Manzanar, which was an agricultural colony that had been developed in the valley by an entrepreneur, George Chaffey, in 1910. By 1925, the city of owned all of the property in the town and surrounding subdivisions.⁴⁰ Prior to its purchase, the town had been known for its extensive apple and pear orchards, many of which

³⁹ Ibid, 137-138.

⁴⁰ Cultural Landscape Report: Manzanar National Historic Site, 22.

were maintained by the city until 1934 when the irrigation was severed in order to direct more water to Los Angeles.

As the years progressed and Los Angeles continued to purchase property on the valley floor, agricultural production began to decrease and some agriculturalists began to leave the area. Often farmers and stock-raisers were given the option of an agricultural lease as a condition of selling their property to the city. The terms of the leases were often less than ideal—annual rent was six percent of the sale value of the property and the city would not grant water allotments, irrigation or long-term leases. Ultimately, these constraints meant that ranching and alfalfa were the only rational choices for production on leased land. Despite the drawbacks, as part of the agreement, however, the seller did receive cash for their property and did not have to pay land taxes. In 1930, there were 218 farms in the valley and in 1940; the number of farms had increased by ten to 228, which suggests that despite the tough lease conditions, many agriculturalists may have found this alternative satisfactory for a limited period of time.⁴¹ For those areas that were not leased and subsequently abandoned, the city of Los Angeles began removing these traces of previous occupation as quickly as possible. In sum, “houses and barns were bulldozed and burned, orchards were uprooted, and once productive fields of alfalfa and grain were invaded by desert shrub”.⁴²

By 1933, Los Angeles had purchased 95 percent of all water-bearing parcels in the valley and 85 percent of the town property.⁴³ Ultimately, between 1905 and 1935, the city of Los Angeles would continue to

⁴¹ Walton, 204-205.

⁴² Sauder, “The Agricultural Colonization of a Great Basin Frontier,” 100.

⁴³ Sauder, “The Lost Frontier,” 147.

acquire land and water rights in the Owens Valley to the extent that today, the city essentially owns the entire valley floor with the exception of a few scattered holdings and American Indian lands.⁴⁴ To supplement their existing water system, the Los Angeles Department of Power and Water built a second aqueduct in 1970 that extends 177 miles from the Owens Valley to Los Angeles.⁴⁵

Fruit Production and the Owens Valley Improvement Company (OVIC): 1910-1924

At the onset of the 20th century, a plan to develop the valley's water resources was initiated by George Chaffey. As a successful and established engineer and businessman from southern California, Chaffey filed for water rights to build a reservoir on Cottonwood Creek and in 1905 bought the Shepherd Ranch and its associated water rights from Shepherd for \$25,000.⁴⁶ Five years later in 1910, Chaffey and his associates established the Owens Valley Improvement Company (OVIC). At this time, Chaffey had successfully purchased more than 3,000 acres of land and owned all of the water rights in Shepherd and Bairs Creek, and a portion of the water rights associated with George's Creek. Chaffey's irrigation plan was initiated with the construction of a concrete pipe and tile factory owned by V.C. Lutzow west of the former Shepherd house to provide materials for the irrigation system.⁴⁷

⁴⁴ Elmore, Mustard, Hamburg, and Manning, 1233.

⁴⁵ Los Angeles Department of Power and Water (LADWP), "History of Water and Power in LA" <www.ladwp.com> February 8, 2010.

⁴⁶ Harland D. Unrau, *The evacuation and relocation of persons of Japanese ancestry during World War II: a historical study of the Manzanar War Relocation Center* (U.S. Department of the Interior, National Park Service, 1996), 171.

⁴⁷ Cultural Landscape Report: Manzanar National Historic Site, 19 and Unrau, 171.



Figure 57: Laying concrete irrigation pipe at Manzanar, ca. 1910 (County of Inyo, Eastern California Museum).

The Owens Valley Improvement Company laid out the first portion of its irrigation colony, Subdivision No. 1, in August 1910. The company began their enterprise by subdividing the old Shepherd Ranch into tracts ranging from 16 to 25 acres each.⁴⁸ In addition, OVIC platted a small town named Manzanar near the center of subdivided tract. After the town site was platted a system of concrete and steel gravity flow irrigation pipes was laid to feed water to the colony from Shepherd and Bairs creeks.⁴⁹ According to the CLR, this particular irrigation system was unique in that it was designed to prevent alkali deposits, which had made large portions of the southern valley unproductive.

⁴⁸ Unrau, 172.

⁴⁹ Sauder, "The Lost Frontier," 125-128.

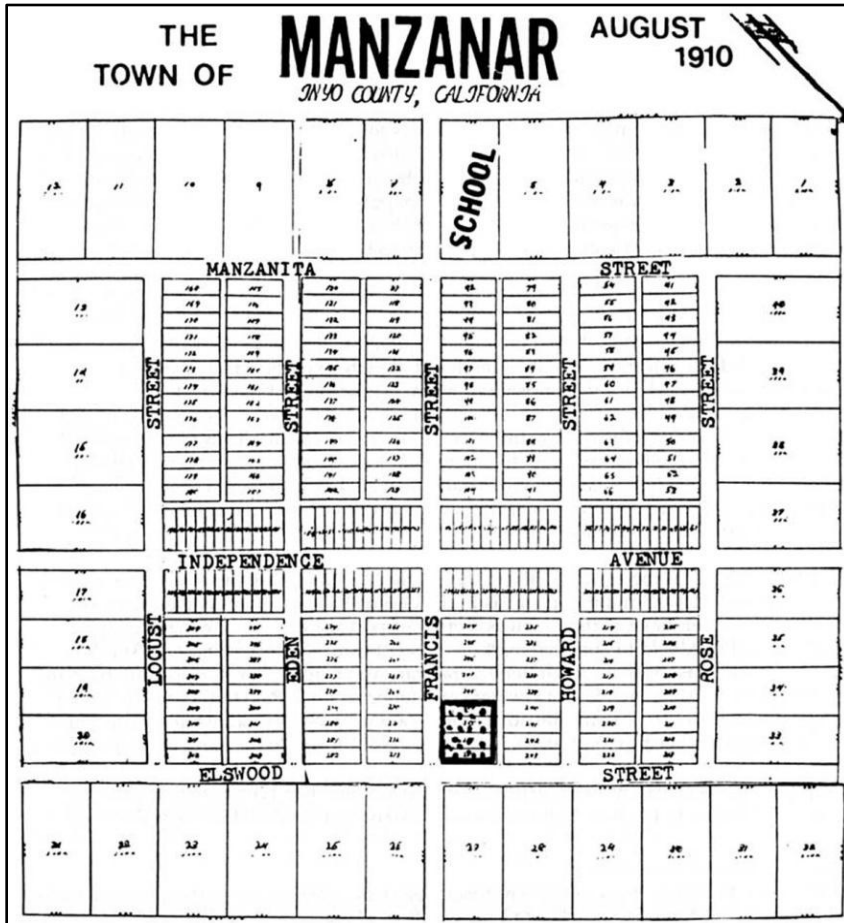


Figure 58: The Town of Manzanar Townsite Plot, August 1910 (County of Inyo, Eastern California Museum).

By 1911, OVIC boasted having 20,000 feet of 8-inch, steel riveted pipe associated with the site. Accordingly, these main pipe lines were to be laid on the roads one-half mile apart, and were to be furnished with taps

for the different tracts.⁵⁰ During this time, the Manzanar Water Corporation owned the water supply and distribution system for about 5,000 acres of land located in and adjoining the Manzanar Tract. In order to support the system, intake dams were constructed on Shepherd and Bairs Creek and the water was distributed throughout the district in an underground steel and cement system to the tracts.⁵¹

The 1000-acre site developed by OVIC was named “Manzanar,” which means “apple orchard” in Spanish. The site was also called the Manzanar Irrigated Farms Tract by locals. The company’s primary motivation was the creation of an agricultural colony based on the production of apples. The Owens Valley, located at an altitude of 3000 to 4500 feet, was known to possess ideal climatic conditions for the production of fruit of high color and good keeping quality, which prompted the development of the colony. In order to achieve this goal, the company offered to plant apple trees and care for them for absentee landowners or to sell the trees directly to residents.⁵² Their plan included the production of various apple varieties including Winesap, Spitzenberg, Rome Beauty, Delicious, Newtown Pippin, and Arkansas Black.

In 1911, the OVIC published a promotional brochure entitled “Fortunes in Apples in Owens Valley, Inyo County, California” to entice settlers to move to Manzanar to grow apples. In sum, the brochure suggested that the region provided unparalleled opportunities for fruit production:

⁵⁰ “Many New Settlers Buying Homes Near Independence,” *Inyo Independent*, January 27, 1911, 1.

⁵¹ “Manzanar Owens River Valley, Inyo County California,” Issued by the Manzanar Commercial Club, Manzanar California, n.d.

⁵² Sauder, “The Lost Frontier,” 125-128.

Judging from the results that have already been achieved in apple-growing in Owens Valley under crude methods—there is reason to believe, that, under scientific culture, and with direct rail connection to Los Angeles and the East, this valley will soon become the greatest apple-growing region in the entire West. . . . The holdings of the Owens Valley Improvement Company comprise about 3,000 acres of the choicest lands in the entire Owens Valley. The most perfect apple lands lie along the foothills where the constant erosion of centuries has washed down the disintegrated granite, which has become mixed with the deep loam, producing a soil that is chemically perfect for the growing of apples. . . . Those who are seeking a substantial money-making opportunity—we say, go into the Owens Valley and plant apple and pear trees.⁵³

The promotional brochure also stressed the importance of the recently completed Southern Pacific rail line, which provided an invaluable connection between southern California and the Owens Valley. With completion of the rail line, there were many opportunities for growers to sell their produce as well as many other benefits:

It opens up for the first time, this marvelously fertile valley for immediate settlement and culture, and puts the Owens Valley farmer in quick touch with the best markets. . . .with Los Angeles and all Southern California now only ten

⁵³ Owens Valley Improvement Company, "Fortunes in Apples In Owens Valley: Facts Concerning the Growing of Apples in the Famous Owens Valley Inyo County—California, n.d.

hours away by direct rail connection, a growing market greater than this entire valley can supply—is not placed at the Owens Valley farmer’s door. . . . And with the new direct rail connections with the East—the Owens Valley apple grower is enabled to compete with the world in supplying the Eastern and foreign markets which are constantly clamoring for the marvelous big red Western grown apples. . . . The opening of all these great markets to Owens Valley can mean but one thing—the early settlement of the entire fertile region.⁵⁴

In addition to the promotional brochure, the company also engaged in a promotional campaign in San Francisco and Los Angeles, advertising 10-, 20-, and 40-acre parcels of land for sale at Manzanar. Parcels included ownership of one share per acre in the Manzanar Water Corporation, which was organized as a mutual water company, but controlled by OVIC, as well as the services of a water distributor.⁵⁵ In 1910, 20-acre tracts were available to new settlers at prices of \$150 and up.⁵⁶ By January 1911, OVIC had sold land in tracts of from 16 to 40 acres to 50 different buyers.⁵⁷ As a result of the advertising campaign, farmers came from as far as Missouri and Indiana, while many others came from southern California and western Nevada as well as from the Independence and Lone Pine.⁵⁸

⁵⁴ Ibid.

⁵⁵ “Manzanar Owens River Valley, Inyo County California,” Issued by the Manzanar Commercial Club, Manzanar California, n.d. and Cultural Landscape Report: Manzanar National Historic Site, 19.

⁵⁶ William L. Kahrl, *Water and Power: The Conflict over Los Angeles’ Water Supply in the Owens Valley* (Berkeley: University of California Press, 1983), 220-221.

⁵⁷ “Many New Settlers Buying Homes Near Independence,” *Inyo Independent*, January 27, 1911, 1.

⁵⁸ Unrau, 172.

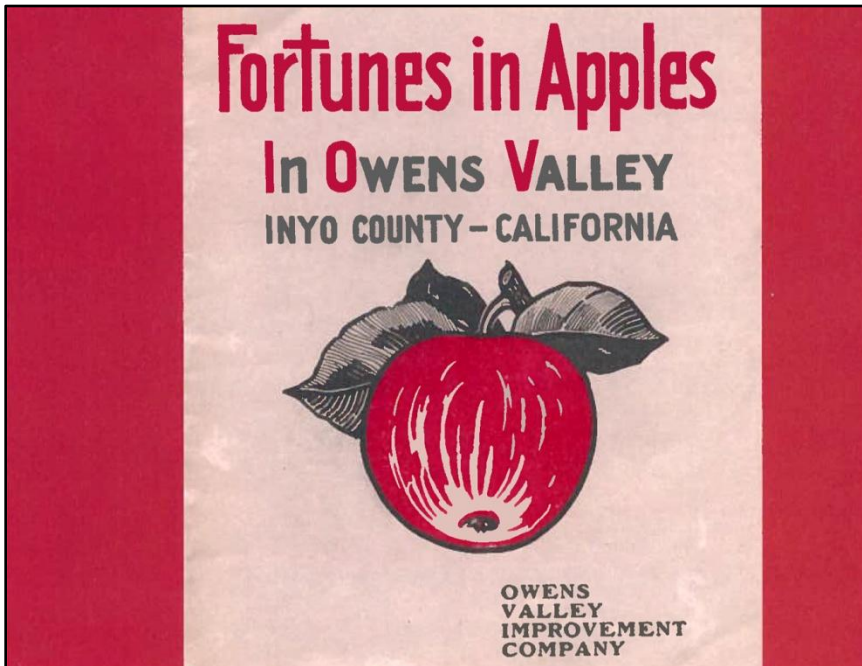


Figure 59: Cover of an Owens Valley Improvement Company brochure promoting locally grown apples (County of Inyo, Eastern California Museum).

In February of 1911, the *Inyo Independent* reported that things were developing rapidly around the community of Manzanar. By this time, many apples had been planted adjacent to the old Shepherd House and on each side of Independence Avenue (now U.S. Highway 395). The apple trees were bought from a company in North Yakima, Washington and were reportedly some of "...the finest ever brought into the valley and ... are absolutely free from scale or any insect pests, having been grown in a country where the climatic conditions are very similar to our own...".⁵⁹ Also at this time, over 20,000 feet of steel riveted pipe had been laid and several buildings were being constructed. A few weeks

⁵⁹ "Much Work Being Done," *Inyo Independent*, February 14, 1911, 1.

later, the *Inyo Independent* reported that at least 20,000 year-old apple trees would be planted that year, and probably more if the trees could be obtained. Of these, 80 percent were Winesap, 15 percent Spitzenberg and the remainder Newtown Pippin.⁶⁰ In 1911, one optimistic reporter suggested that “Within a few very short years there is no doubt but this will be one of the apple countries of the west.”⁶¹ In the same year, town residents Ira L. Hatfield and W.B. Engle planted nearly 50 acres of apple trees on their own farms, which helped to promote settlement of the colony through their membership in the Manzanar Commercial Club.

By 1912, the agricultural colony began to take shape near a “straight, broad highway” that had been constructed between Independence and Manzanar. Independence Avenue and Francis Street (now the Manzanar-Reward Road) intersected near the center of town. East-west streets in the town were laid out at one-mile intervals, and north-south streets ran parallel to Independence Avenue. As the community developed, roads were graded and buildings were constructed, which included a two-room school, a community hall (a portion of which housed the packing house), cannery, garage, blacksmith shop, and store.⁶² Ultimately, the larger OVIC development consisted of the 160-acre town site, divided into 312 lots, and two outlying subdivisions comprising 3,000 acres, which were divided into 140 lots.

⁶⁰ “Many New Settlers Buying Homes Near Independence,” *Inyo Independent*, January 27, 1911, 1.

⁶¹ “Many Settlers Buying Land,” *Inyo Independent*, February 24, 1911, 1.

⁶² Cultural Landscape Report: Manzanar National Historic Site, 20.

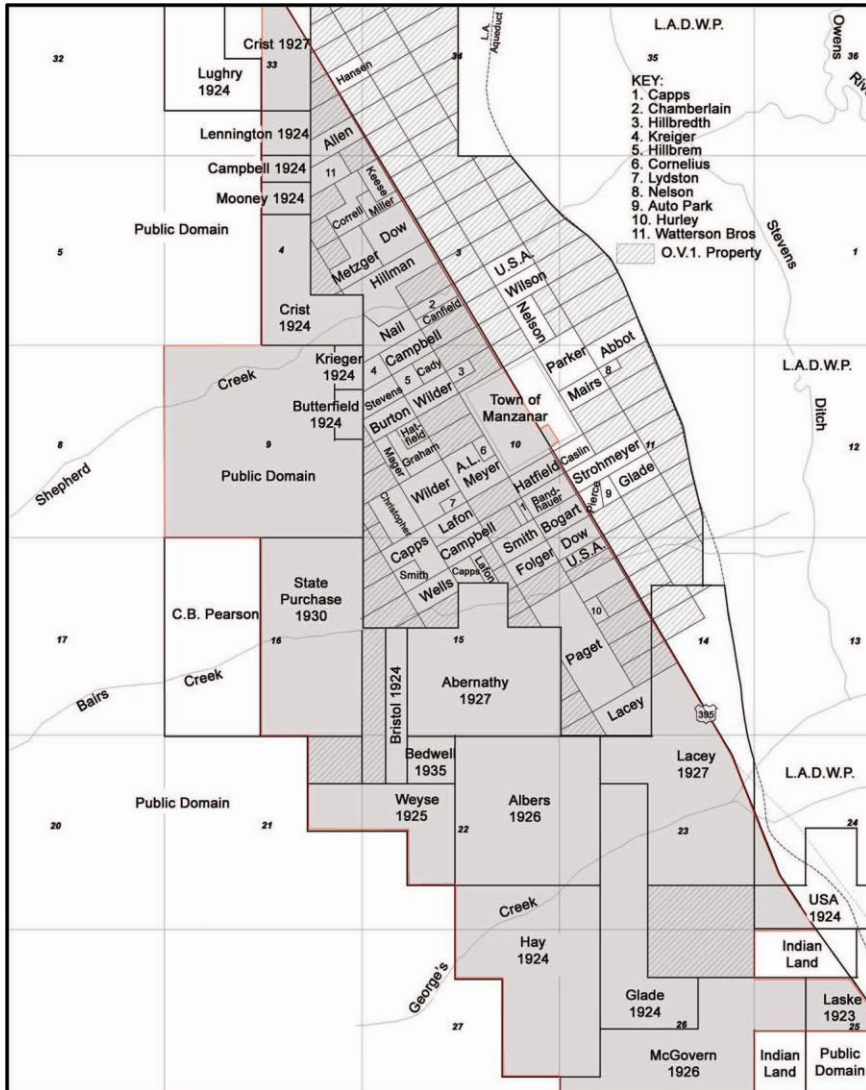


Figure 60: Land ownership map of Manzanar, 1927 showing lands owned by Lafon, Lydston, Wilder, and Hatfield, among other orchard growers (Cultural Landscape Report: Manzanar National Historic Site, 21).

As the agricultural community of Manzanar continued to develop, the production of fruit crops became a common thread. According to the California State Board of Agriculture 1914 Year Book:

Owens Valley has the elevation and climatic conditions which are the most important factors in the development of first class deciduous fruit. That this is true is borne out by the fact that the fruit buyers of long experience are strong in their praise of Inyo County apples and pears, and claim the fine color, flavor and excellent keeping qualities are unsurpassed. Orchardists are specializing in the "Big Red Apple" varieties, such as Winesaps, and Spitzenbergs, and also in Bartlett Pears. Other varieties of apples produced are, White Winter Pearmain, Yellow Newtown Pippins, Arkansas Blacks, and others. First prizes have been taken by Owens Valley apples wherever they have been displayed.⁶³

⁶³"Manzanar Owens River Valley, Inyo County California," Issued by the Manzanar Commercial Club, Manzanar California, n.d.



Figure 61: Orchard at Manzanar, ca. 1910s (County of Inyo, Eastern California Museum).

In 1917, the Inyo County Board of Supervisors commissioned the California Development Board to compile a study of the county that provided unbiased “facts of interest and guidance to the prospective home seeker and settler”. In this report, the commission indicated that “Apples next to alfalfa are the most promising and important agricultural product”. At the time of the survey in 1917, there were approximately 60,000 non-bearing and 94,000 bearing apple trees in Inyo County, although it was suggested that the profitability of pears were quickly becoming second in importance to apples. Generally, the apple trees were planted in a 30 by 30-foot grid (40 trees/acre) and no cover crops were planted. Often young orchards were intercropped with corn, beans, peas, berries and tomatoes, while some of the older orchards had gooseberry and current bushes planted between the trees. Throughout the valley, a number of varieties of apples were grown, such as Winesap, Newtown Pippin and Jonathan, which were commercially shipped.

Other varieties including Esopus Spitzenberg, Arkansas Black, Rhode Island Greening, White Winter Banana, Grimes Golden, and a Golden Lover. Other varieties were also grown in limited quantities in the locale.⁶⁴

By 1918 enough fruit was being produced to necessitate the establishment of the Manzanar Fruit and Cannery Association. The organization was created to “conduct and carry on . . . the business of canning, preserving, drying, packing and otherwise handling, disposing of and selling all kinds of deciduous and other fruits, and all kinds of vegetables”.⁶⁵ As the fruit trees at Manzanar began producing, John M. Gorman reported that “one hundred and forty-five boxes of field picked Delicious apples from one single tree” were harvested. As a result of its successes, Manzanar became known as “The Land of Big Red Apples”.⁶⁶ Considerable activity in land sales and prospective building construction continued and in 1919, Ira L. Hatfield, who held a position of authority in the Owens Valley Improvement Company’s branch office at Manzanar, confirmed the reports by giving the names of recent purchasers of acreage from the improvement company. At this time, Hatfield confirmed that Albert Lafon had purchased two acres of land, while C.C. and Paul Lafon acquired 20 acres.⁶⁷

In addition to apples, residents associated with the OVIC development also planted pears, peaches, grapes, onions, potatoes, alfalfa, corn and wheat. Beehives were also tended for honey production. By 1920, there

⁶⁴ California Government Board, “Apple Crop Information,” Agricultural and Industrial Survey of Inyo County, June-July 1917.

⁶⁵ Cultural Landscape Report: Manzanar National Historic Site, 20.

⁶⁶ Henry Raub, “Local Nostalgia,” Part I (February 12, 1988) and Part II (February 19, 1988).

⁶⁷ “Manzanar Active,” unknown newspaper source, February 22, 1919.

were 57 households and 203 residents in the Manzanar community, while the school had nearly 50 students enrolled.⁶⁸ More than 28,000 orchard trees reached bearing age between 1910 and 1920 in the Owens Valley. The apples and honey produced in this region consistently took prizes at the San Francisco Midwinter Fair and the Lewis and Clark Exposition in Portland.⁶⁹

John Gorman recalled the following in regard to the orchards at Manzanar during the 1920s:

There were about 480 acres of apples, most of them Winesaps, Spitzenburgs, Roman Beauty's, Delicious and New Town Pippens. In addition to apples, there were about 30 acres of Bartlett Pear, some 30 or 40 acres of Alberta peaches, 5 of prunes and several acres of grapes. The owners had planted the peaches in between the rows of apple trees to provide income until the apple trees were old enough to bear. They had also planted two rows of peach trees about half a mile long which they donated to the public so people wouldn't get into the main orchards and break down the branches. They also gave away all the peaches that fell to the ground. The Indians came from near and far and set up camps where they dried the peaches. . . . A packing house had been built and was being used to can the peaches and pack the apples. They had four 40 gallon pressure cookers and used about a dozen girls to peel and halve the peaches and pack them in gallon cans. I think they were labeled

⁶⁸ 1996 General Management Plan and Environmental Impact Statement, 39.

⁶⁹ Kahrl, 223.

“Manzanar Special.” The warm days and cool nights produced some of the finest peaches that ever grew.⁷⁰

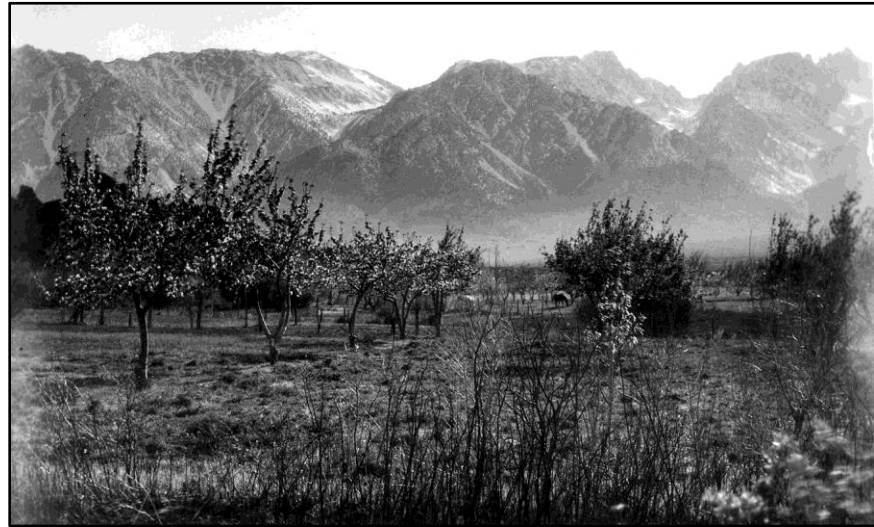


Figure 62: Fruit Trees at Manzanar, ca. 1920s (County of Inyo, Eastern California Museum).

As fruit production continued to increase at Manzanar, similar horticultural trends were occurring in northern parts of the valley, particularly in the Bishop area where improved irrigation facilities tempted ranchers and stock raisers to experiment with specialized crops such as fruit trees. While the acreage devoted to apple production significantly expanded during the 1910s and 1920s, particularly at Manzanar, many valley residents believed that the production of pears would supersede that of apples. In 1917, the Inyo County Board of Supervisors commissioned the California Development Board to compile

⁷⁰ John M. Gorman, *I Remember Manzanar*, (Bishop, California: Pinon Press, 1967).

a study of the county that provided unbiased “facts of interest and guidance to the prospective home seeker and settler.” After completing their assessment, the board reported that pears would probably become the leading fruit crop in Inyo County, which may have been in contradiction to their analyses of apple production in the valley. At this time there were approximately 14,500 bearing pear trees and 3,150 non-bearing fruit trees in the county. According to the report, generally, the pear trees that were planted first in the valley had a 20 by 20-foot grid (106 trees/acre), while trees that were planted later had a 24 by 24-foot grid (76 trees). In addition, the Winter Bartlett and Winter Nellis were two most extensively grown pears, although Summer Bartletts, Sugar Pear and a few Kieffer Pears were also grown in the valley. It should also be noted that cover crops were planted in pear orchards in Inyo County as early as 1915. Some of the crops that were grown include: white clover, alfalfa, Melilotus (yellow sweet clover), rye or barley.⁷¹

As a result of the 1917 report as well as a number of factors, residents in the north end of the valley soon encouraged the production of pears. During this period, residents and newspaper reporters alike believed that the production of high-value specialty crops like pears would make water rights safe from Los Angeles. Another trend that encouraged the production of pear trees in the valley stemmed from the fact that a significant number of pear orchards in other parts of the county had largely been destroyed by Fireblight in the 1920s. Due to the outbreak of the blight, pear production began shifting westward into California and as a result pears were often considered the most profitable of the deciduous fruits. Furthermore, the U.S. Department of Agriculture recommended planting commercial pear orchards at elevations ranging

⁷¹ California Government Board, “Pear Crop Information,” Agricultural and Industrial Survey of Inyo County, June-July 1917.

from 3,000 to 5,000 feet to avoid blight, which made the Owens Valley the perfect location for the propagation of pear trees.⁷²

The Inyo County Pear Growers' Association was organized in the early 1920s to further encourage the production of pears, although membership was initially low. In the spring of 1921, nearly 20,000 pear trees were planted in the valley and the number of fruit trees planted in 1922 was nearly double, many of which were pear trees. Statistics show that between 1920 and 1925 the number of bearing pear trees in the valley increased 3,405 to 37,753, while the number of bearing apple trees increased from 17,963 to 52,621. With the exception of Manzanar, many of the fruit trees planted on the higher, relatively frost-free fan deposits in the West Bishop and Sunland districts adjacent to the Owens River Canal. Fruit growing was always precarious at Bishop (elevation 4,450 feet) even on the high sloping fans near the base of the Sierra where the average frost-free season is 152 days.⁷³ In these locations, subdivided parcels were selling for as much as \$350 per acre in 1920.⁷⁴

The Owens Valley Apple Growers Association packed and shipped approximately 12,500 boxes of apples in 1922. It was reported that at both Independence and Manzanar there was a large yield with many very fine grade apples, although production also occurred near Bishop and Big Pine. According to the *Inyo Independent*, "Apple experts claim that Owens Valley apples this year are far ahead of anything produced in any of the apple growing sections of the West, and the care that has been taken in marketing these apples will give them a standing that will accrue

⁷² Sauder, "The Lost Frontier," 131-133.

⁷³ Ruth E. Baugh, "Land Use Changes in the Bishop Area of Owens Valley, California," *Economic Geography* 13, no. 1 (Jan., 1937), 32.

⁷⁴ Sauder, "The Lost Frontier," 131-133.

to the benefit of the apples growers of Owens Valley for all time to come.”⁷⁵ As a result of the superior quality of the apples packed by the Owens Valley Apple Growers Association, these apples commanded the highest price on the Los Angeles market for a week in the fall of 1922.⁷⁶

Acquisition and Management of Manzanar Orchards by the City of Los Angeles: 1924-1934

By 1922, Los Angeles began to purchase lands and water rights within the community of Manzanar. R.A. Wilder sold his property to LADWP in 1922 for \$17,000—it included a 25-acre pear orchard and a 10-acre cultivated field.⁷⁷ In September 1924 the city had purchased all of the OVIC holdings and associated water rights for \$320,220. This included 300 acres of orchards, 70 acres of alfalfa fields, 80 acres of other cultivated fields and 1,820 acres of pasture.⁷⁸ LADWP purchased land from V.N. (Vic) Christopher in 1924 for \$12,500. At the time of its sale, the property had been planted to orchards and included apples, peaches and prunes.⁷⁹ In 1925, Ira Hatfield sold his property, which included a 25-acre orchard and 5-acre field to the city for \$8,500.⁸⁰ Many other farms such as the Meyers, Wells, Park and Cornelius also had orchards at the time of their sale to Los Angeles in the 1920s. In less than three years the city owned all of the Manzanar development, which included the townsite and Subdivisions 1, 2, and 3, which amounted to approximately

⁷⁵ “Apple Crop 12,500 Boxes,” *Inyo Independent*, October 29, 1922.

⁷⁶ “Owens Valley Apples,” *Inyo Independent*, October 14, 1922.

⁷⁷ Jeffery F. Burton et al., *Three Farewells to Manzanar: The Archeology of Manzanar National Historic Site, California, Vol. 2, Publications in Anthropology 67* (Tucson: United States Department of the Interior, Western Archeological and Conservation Center, National Park Service, 1995), 469.

⁷⁸ *Ibid.*, 453.

⁷⁹ *Ibid.*, 429.

⁸⁰ *Ibid.*, 449-450.

3,000 acres of land.⁸¹ After the sale, many Manzanar residents left the valley, although some settled in Independence or Lone Pine and became employees of the Los Angeles Department of Water and Power. While it was their secondary objective, the city did manage the orchards and continued operating the packinghouse located in the town's community hall for several years.

In the June 13, 1926, edition of the *Los Angeles Times Farm and Orchard Magazine* it was reported that out of the 3,000 acres acquired by the city of Los Angeles from OVIC, approximately 1,200 acres had been previously developed, many of which had been orchards. Prior to the city's acquisition of the property, about half of the Manzanar tract had been sold to individual owners, while the remaining half was being operated and farmed by OVIC who had subdivided it. Victor Christopher served as the farm manager during OVIC operations. Christopher continued to function in a similar capacity after the city purchased the land, although his priorities were associated with leasing and maintenance. John M. Gorman may have also served in a leadership position during this transition period, assisting with day-to-day operations at the city-owned orchards at Manzanar.⁸²

⁸¹ Unrau, 176.

⁸² Gorman, 15-22.

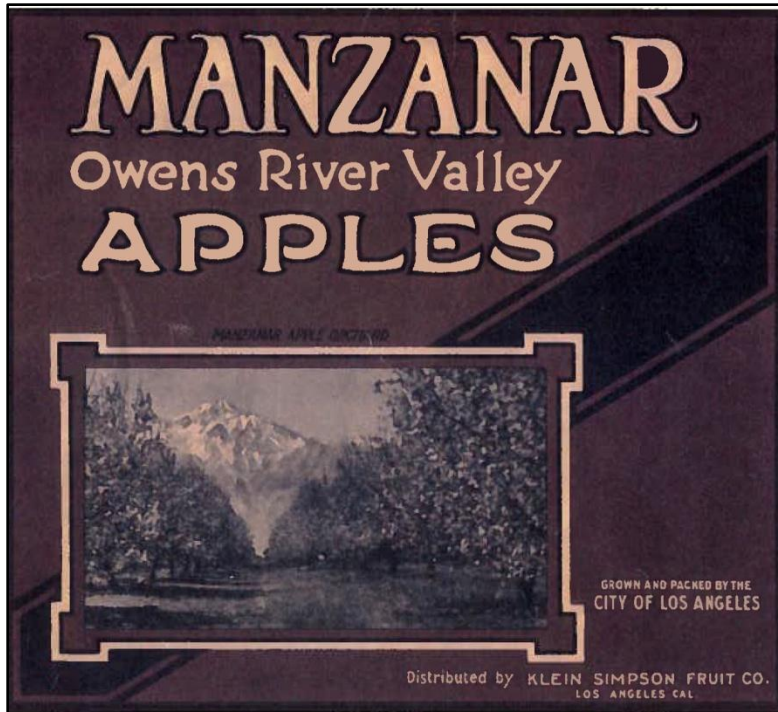


Figure 63: Klein Simpson Fruit Company crate label promoting Manzanar apples on behalf of the owner, the city of Los Angeles (County of Inyo, Eastern California Museum).

Projects performed under the new ownership included a “severe pruning” and “good irrigation.” The newspaper reported that Christopher had to “yank out eighty acres of pear on one place because of blight.” Despite the blight, over 300 acres of fruit trees were in good condition, having been pruned, sprayed and irrigated. Approximately 1/3 of these trees had been leased in the 1926 season to a Los Angeles company named Klein Simpson Fruit Company, while the remaining acreage was managed by the city.⁸³ The 1926 Manzanar crop included

⁸³ Unrau, 179.

six carloads of peaches, 12 of Bartlett pears, and 37 carloads of apples. The majority of the apples were Winesap, although Delicious and Arkansas Black were also included. As a result of a late spring frost, the next year's fruit crop was less productive. The city claimed that the poor fruit crop would "in all probability lead to the discontinuance of orchard planting and use of the lands along surer and constantly remunerative channels."⁸⁴

In the 1927 season, late spring frosts destroyed a significant portion of the Manzanar and Owens Valley fruit crop, proving the uncertainty of the location for profitable fruit growing. Despite the uncertain future of agricultural operations at Manzanar, as late as 1928 the city maintained that, in building the aqueduct, Los Angeles "sought only to use the surplus waters of Owens River after the needs of the ranchers had been fulfilled."⁸⁵

⁸⁴ Cultural Landscape Report: Manzanar National Historic Site, 23.

⁸⁵ Kahrl, 216-217.



Figure 64: Oblique aerial view of town of Manzanar agricultural colony in 1931 showing orchards now owned by the city of Los Angeles (UCLA Department of Geography Aerial Photo Archives).

As the city continued to acquire property in the valley, many of the town residents who relied on agriculture for their livelihood left the area. Ultimately, Los Angeles was most concerned with protecting the watershed, rather than supporting the agricultural-based community.⁸⁶ In 1934, Los Angeles stopped irrigating the orchards and fields to increase groundwater pumping and by 1935 the LADWP removed the last resident from the site, a poultry farmer named Clarence Butterfield. On October 6, 1941, the Inyo County Board of Supervisors passed a

⁸⁶ Cultural Landscape Report: Manzanar National Historic Site, 23.

resolution at the request of the city of Los Angeles that “all streets, alleys, lanes, etc. in the Town of Manzanar” be abandoned.⁸⁷

Local newspaper articles documented subsequent acts of the city to remove remaining fruit trees and residential development. A series of articles in the *Sacramento Union* supported the belief that Los Angeles had unjustly seized control of the area, letting the community of Manzanar wither away as its water resources were channeled out of the valley. The newspaper articles declaimed the “Pitiful Story of an Agricultural Paradise Created by California Pioneers, Condemned to Desert Waste by Water Looters.”⁸⁸

Manzanar was once famous for its apple. The orchardists of Manzanar won first prize at the State Fair in Sacramento and at the Watsonville apple show. Los Angeles water and power board came and bought every orchard and ranch that its agents could trick the owners into selling. The city immediately diverted the water from the ditches into the aqueduct. It dug wells and installed pumps to exhaust the underground water supply. Today Manzanar is a ghastly place. The orchards have died. The city has sent tractors to pull up the apple trees. Vigorous trees just coming into full bearing are prostrate in one field; across the road the blazing trail of the firebrand is visible.

⁸⁷ Ibid, 24.

⁸⁸ Ibid, 23.

The houses left by farmers who had sold their properties to the city sat abandoned, and some were rented to LADPW employees, farm tenants and other workers from the surrounding towns. Some Manzanar buildings were dismantled and their materials were reused, while some were moved to Independence and Lone Pine and others were left to deteriorate.⁸⁹ Some of the remaining fruit trees were cut down after the water was cut off to orchards. By the 1940s, many of the buildings associated with the community of Manzanar had been demolished and a mix of native desert-scrub species had reclaimed the former fields, although, scattered fruit trees and some remnant orchards survived, despite the harsh high-desert environment. Later, bulldozers were used to push fruit trees and ornamental trees over for development of the Manzanar War Relocation Center.



Figure 65: Overgrown Manzanar orchard, ca. 1930 (County of Inyo, Eastern California Museum).

⁸⁹ Cultural Landscape Report: Manzanar National Historic Site, 24.

Manzanar War Relocation Center: 1942-1945

After the December 7, 1941 attack on Pearl Harbor, the United States became embroiled in a conflict with Imperial Japan that led to the country's involvement in World War II. Soon after the attack, fear of potential sabotage and espionage by Japanese Americans became a widespread concern. On February 19, 1942, President Roosevelt issued Executive Order 9066, which authorized the internment of anyone of Japanese ancestry living on the West Coast. Less than a month later, the United States Army advised LADPW that it was assuming control of approximately 4,725 acres of the city's holdings in the Owens Valley "for so long as the present emergency requires."⁹⁰ As a result, the former agricultural property known as Manzanar was appropriated for use as a relocation center.⁹¹ Ultimately, ten relocation centers were built in seven states across the country (Arkansas, Arizona, California, Colorado, Idaho, Utah and Wyoming). The centers were often located in relatively undesirable environments such as in remote deserts, plains and swamps. Manzanar was located in one of the most challenging locales; an isolated high-desert environment. Approximately two-thirds of the Japanese Americans interned at Manzanar were American citizens by birth, while the remainder was aliens who had lived in the U.S. for many years, but had been denied citizenship.

The first Japanese Americans arrived at Manzanar in March 1942 to build the barracks and associated camp infrastructure. The War Relocation Authority assumed control of Manzanar in June and internees began

⁹⁰ Kahrl, 367.

⁹¹ Ibid.

arriving shortly thereafter. At its peak, the population of the Manzanar numbered 10,026 people and conditions were rough. The 500-acre housing section was surrounded by barbed wire, and supported a dense population. The internees lived in barracks buildings that were crowded and ill suited for the extremes of the desert environment. Despite the harsh conditions, internees worked to build a community, and established their own system of local government, their own police and fire departments. They also established their own shops, offices, medical services, schools, parks, museums, libraries and published a newspaper, the *Manzanar Free Press*.⁹² In addition to these services, internees also maintained farms at the site, planting fields of alfalfa, hay and vegetables, while maintaining remnant fruit trees and orchards to provide fresh produce.⁹³

⁹² Kahrl, 372-373.

⁹³ Ibid.



Figure 66: Historic photo of remnant apple trees from the Manzanar Town Era incorporated as street trees along a road of the Manzanar War Relocation Center (National Archives and Records Administration, #210-GC-10).

As Manzanar War Relocation Center developed into a community, extensive efforts were made by camp administration and internees to improve the physical conditions. These efforts reflected a multitude of needs, which included dust control and the development of garden and park spaces. Another initiative focused on the restoration of remnant fruit trees and associated orchards located in firebreaks and in the camp perimeter areas. Many of these trees were remnants of previous agricultural life ways associated with the Wilder, Lafon, Lydston, Hatfield and Christopher families among many others. As the camp developed and barracks were constructed, many of the existing fruit

trees and orchards were incorporated into the layout of the blocks as garden or street trees. In many ways, organization of the camp road system appears to have paralleled some of the orchards, which allowed them to function as linear rows of street trees, providing welcome shade and visual distinctiveness to the barracks that were fortunate enough to be sited amongst them.

Serendipitously, the Manzanar War Relocation Center housed a number of experienced Japanese American orchardists that could maintain the existing fruit trees and orchards. Upon arrival, an orchard crew was established under the supervision of Mr. Frank Cummings. Mr. Takeo Shima was the orchard foreman, assisted by Hideo Marumoto, Gummi Watanabe and a crew of approximately 20 to 40 members. Initially, the orchard crew was tasked with the rejuvenative pruning of the fruit trees that remained from the town of Manzanar. Later, the crews worked to maintain the orchards, while also managing the harvest and distribution of the crop.

As internees settled into camp life, the maintenance and subsequent harvest of the remnant fruit trees became an important part of daily life. An excerpt from the *Manzanar Free Press* (n.d.) stated that in 1942, the neglected orchard of “600 apple and 400 pear trees” had been pruned, thinned out, sprayed and irrigated. In August 1942 the *Manzanar Free Press* reported that the pear harvest had just begun. After ten years of neglect, this was the first time that pears were harvested at the site since LADPW abandoned them for not producing enough to support their maintenance.



Figure 67: Guard standing in front of a fruit tree at Manzanar War Relocation Center. Note the internee pruning the tree (National Archives and Records Administration, #210-GC-97).

The 1942 harvest was projected as 4,000 boxes of pears, many of which were to be stored in warehouses to ripen. Later, the pears would be consumed by internees in the mess halls.⁹⁴ Subsequent *Manzanar Free Press* articles reference the first year's harvest as including Bartlett and

⁹⁴ "Harvesting of Pears from Orchards Begins," *Manzanar Free Press*, August 26, 1942.

Winter Nellis pears and Newtown Pippin, Winesap and Yellow Belleflower apples. At the time, many of the orchards contained about 40 acres of what were considered “very fine trees” and were expected to produce again with sufficient irrigation.⁹⁵ Ultimately, the orchards at Manzanar produced nearly \$2,000 worth of fruit during the 1942 season.⁹⁶

By June 1944 the population of Manzanar had declined to 5,567 people.⁹⁷ The last resident of Manzanar left the camp on November 21, 1945 approximately three months after the war had ended. In April 1947, the former Manzanar War Relocation Center site was returned to the Los Angeles Department of Water and Power.⁹⁸ The fields were destroyed, infrastructure was dismantled, and the barracks were disassembled and hauled away. The fruit trees once again fell into neglect and the desert scrub plant community quickly reclaimed portions of the site. Only the hardiest introduced vegetation, including several species of fruit trees, was able to survive the harsh desert environment as well as the ravages of cattle grazing and wildfire.

⁹⁵ Kahrl, 372-373.

⁹⁶ Unrah, 444.

⁹⁷ Kahrl, 372.

⁹⁸ Unrah, 818.



Figure 68: In an attempt to deter the cutting of tree blossoms and limbs, a sign located in Manzanar War Relocation Center read: *"This orchard will produce fruits if we refrain from cutting flowers and limbs. All violators will be prosecuted"* (Manzanar NHS library and archives).

Contemporary Use and Management of Manzanar: 1972-present

Nearly three decades after Manzanar was closed, the site was designated California Historic Landmark No. 850 in 1972. Subsequent efforts led to the listing of Manzanar in the National Register of Historic Places on July 30, 1976, and in February 1985, the site was designated a National Historic Landmark (NHL). In 1992, Congress recognized the importance of protecting and interpreting the historical, cultural, and

natural resources associated with the relocation of Japanese Americans during World War II by establishing the Manzanar National Historic Site.

In 1995 the remnants of five orchards were reported within the boundaries of the National Historic Site. The largest concentration of extant pear trees was located in an area historically associated with the Wilder Farm, which included portions of the Manzanar War Relocation Center Children's Village and residential blocks 28, 29, and 34. In 1995, many of fruit trees in the northern portion of the Wilder orchard were dead or dying, while those in the southern portion appeared to be generally healthy. Moderately healthy apple trees were also reported in residential Blocks 5 and 11, which encompasses the former Lafon Farm. Other documented orchard remnants included dead pear trees in the former Hatfield Farm; dead apple trees at the former Capps Farm; dead pear trees in the Doctors and Nurses Quarters Block; and dead pear trees in the adjacent firebreak that was part of the former Christopher Farm.⁹⁹

In 1996, the National Park Service completed a General Management Plan/Environmental Impact Statement (GMP/EIS) for Manzanar. The plan set forth a management philosophy for the landscape, including the orchards. The GMP recognized that the extant orchards as significant landscape features that link the principal stages of the site's history (GMP/EIS, 1996, 11). The document called for preservation of the primary extant orchards dating from pre-camp days, and the perpetuation of fruit trees through cuttings or seed propagation to maintain the orchards. Shortly after the GMP's completion, the property

⁹⁹ Burton et al, 483.

was officially transferred from the city of Los Angeles to the NPS on April 24, 1997.

Stabilization recommendations for the most threatened landscape features were prepared in 2005 by the Olmsted Center for Landscape Preservation, in partnership with the Pacific Great Basin Support Office Cultural Landscapes program and the Western Archeological and Conservation Center in a Landscape Stabilization Plan (LSP). In 2005 time, most historic trees were in very poor condition, requiring emergency stabilization to prevent mortality. The LSP was prepared in two parts, Part I a 2005 condition assessment and description of the work needed, and Part II, a technical reference manual with product information sheets and bulletins. The LSP's primary objective was to provide stabilization recommendations to halt further deterioration and prevent loss until an Orchard Management Plan could be completed. Since completion of the LSP, park staff has worked hard to stabilize historic trees by pruning, deadwooding and providing irrigation.

Beyond completion of the LSP, a Cultural Landscape Report (CLR) was prepared in 2006. This document describes the comprehensive history and significance of the park cultural landscape, an analysis of existing conditions, and a treatment plan for all cultural landscape resources. In sum, the CLR establishes the treatment philosophy, approach, guidelines and tasks with prioritization for the treatment of the park's cultural landscape, including the park orchards. The LSP and CLR have informed staff efforts to actively manage the cultural landscape, and provide interpretation.



Figure 69: Photo showing stabilized historic pear trees in the Wilder Orchard (PWRO, 2010).

In 2004, the park's interpretive center was opened in the rehabilitated camp auditorium building, representing a milestone for park management. Recent landscape stabilization work has included the excavation and documentation of gardens at Merritt Park and the Block 34 Garden. Extensive work has also been completed on historic orchards and fruit trees at the site through pruning, irrigation and regular preservation maintenance. Other work since 2005 includes the installation of a vault toilet in the cemetery parking area; installation of interpretive wayside panels; reconstruction of two internee buildings; the eradication of tamarisk trees, and cyclic preservation maintenance of historic structures.

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SUPPLEMENTAL INFORMATION

National Register Eligibility of Fruit Trees and Orchards

Historic orchards, a group of fruit trees, or a single fruit tree with integrity that predate 1945 can be eligible for listing in the National Register of Historic Places.¹⁰⁰ Fruit trees or orchards may be eligible for listing individually, or as a contributing feature that is part of a larger historic property. Orchards may also be listed individually on the National Register as historic districts or historic sites. Furthermore, a group of fruit trees or a single fruit tree may be listed individually as a historic site. If orchards or a fruit tree lack individual distinction but contribute to the significance and integrity of a larger property, then an orchard, group of fruit trees, or a single fruit tree may be included in the National Register nomination as a contributing feature to a historic district or site.

To be eligible for listing in the National Register of Historic Places, an orchard, group of fruit trees or an individual fruit tree must possess significance in at least one of four criteria for evaluation:

¹⁰⁰ Information is drawn from S. Dolan, *Fruitful Legacy: A Historic Context of Orchards in the United States with Technical Information for Registering Historic Orchards in the National Register of Historic Places*, (United States Department of the Interior, National Park Service, Olmsted Center for Landscape Preservation, Pacific West Regional Office-Cultural Resources, Park Historic Structures and Cultural Landscapes Program, 2009).

- Criterion A: Associated with events that have made a significant contribution to the broad patterns of our history.
- Criterion B: Associated with the lives of persons significant in our past.
- Criterion C: Embodying the distinctive characteristics of a type, period, method of construction, or represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.
- Criterion D: Having yield or may be likely to yield, information important in prehistory or history.

The National Register Criteria for Evaluation can be applied to orchards, groups of fruit trees, or single fruit trees, and may be applied in more than way. Three of the four criteria, specifically A, B, and C, have two or more applications to orchards and fruit trees.

In addition to meeting at least one of the four criteria for evaluation, an orchard or group of fruit trees must possess integrity. Historic integrity is a measure of physical authenticity conveyed by extant characteristics or features that were present during the period of significance. The National Register has defined the concept of integrity as multifaceted by containing seven aspects. Collectively, the seven aspects provide the measure of authenticity through location, design, setting, materials,

workmanship, feeling, and association. The seven aspects of integrity are conveyed in cultural landscapes through their extant landscape characteristics and constituent features.

Establishing the period of significance, level of significance (local, state, or national), boundary, and contributing resources are also important components to consider when assessing the eligibility of a cultural landscape. For more information see Chapter 5 of *Fruitful Legacy: A Historic Context of Orchards in the United States, with Technical Information for Registering Orchards in the National Register of Historic Places*.

Historical Development of Orchards and Fruit Trees in the United States

In a *Fruitful Legacy: A Historic Context of Orchards in the United States, with Technical Information for Registering Orchards in the National Register of Historic Places*, four general periods of evolution orchard horticulture in the United States are described.¹⁰¹ The earliest period begins in approximately 1600 and extends to 1800 when European fruit trees were introduced and planted for subsistence farming as well as for pleasure. The next period of development extends from 1801 to 1880 when collectors and entrepreneurs developed fruit varieties in the United States. The period between 1881 and 1945 focused on

¹⁰¹ From S. Dolan, *Fruitful Legacy: A Historic Context of Orchards in the United States with Technical Information for Registering Historic Orchards in the National Register of Historic Places*, (United States Department of the Interior, National Park Service, Olmsted Center for Landscape Preservation, Pacific West Regional Office-Cultural Resources, Park Historic Structures and Cultural Landscapes Program, 2009).

commercialization, technology, and regionalism, while the most recent era of development, 1946-present, is characterized by the intensification of orchard production and the commonplace occurrence of dwarf trees. Not surprisingly, the appearance of orchards and individual fruit trees has evolved considerably during these periods, each marked by distinctive characteristics and features. During the last 400 years, the evolution of orchards in the United States is marked by these trends: a transition to variety trees rather than seedling trees; a transition to dwarf trees rather than full-sized or standard trees; and an increase in the number of varieties grown during the past several centuries, but a dramatic decrease during the past 100 years.

Between 1600 and 1800 orchard fruits were first introduced into America by European settlers, and most orchards were started from seed, rather than from trees planted out. These early orchards were grown principally for cider production and animal feed, rather than for edible table fruits. Orchards were highly irregular in form and as a result of sowing consisted of ungrafted seedling trees of no variety. Seedling fruit trees were highly irregular in form, rather like forest trees, and virtually no pruning was performed. However, livestock was allowed to graze beneath the trees, where they browsed off young tree limbs. As a result, seedling fruit trees had tall trunks, often over six feet tall.

From 1801 to 1880 grafting and planting became standard practices for starting an orchard rather than sowing, marking a transition from cider production to edible table fruits of all kinds. Variety trees replaced seedlings because their fruit was good to eat raw, and hundreds and sometimes thousands of American orchard fruit varieties were created by

American plantsmen. Commercial orchards were established, first on the East Coast and then throughout the United States. Variety fruit trees were spread throughout the country by migrating settlers. Horticultural literature, horticultural societies and show popularized American fruit varieties, but still very little pruning or horticultural management was performed. Orchards had a more geometric form due to the use of grafted fruit trees, rather than sowing seeds, though individual trees still had a relatively natural, unpruned form with a tall trunk as in the previous period. Variety trees were grafted onto seedling rootstocks, giving rise to full-sized, standard trees.

The modern era of orchard fruit growing from 1881 to 1945, the period with which the fruit trees at Manzanar NHS are associated, is characterized by increased technological development of the orchard and a dramatic decrease in the number of fruit varieties grown. The 1880s mark the turning point in the apparently synchronous development of orchards and their fruits until this time. In this modern era the history of orchards and orchard fruits deviate drastically in growth with the development of orchards continuing to grow in complexity and diversity of varieties shrinking rapidly. This era represents the development of standardization of an orchard industry, with a transfer of control from the hands of private individuals and pomologists to the federal government and agribusiness. The work of growing fruit trees is relinquished by small independent farmers to become dominated by professional growers organized in business cooperatives. The Owens Valley Improvement Company (OVIC) was one such cooperative organization. Scientific changes in orchard management are advanced by the systematic research efforts of universities, and apple growing is fundamentally changed with the discovery of two new varieties, (Red) Delicious and Golden Delicious.

Key developments that occurred during this period include the following: increased involvement by the federal government; advent of pesticides/disease infestations; establishment of agricultural experiment stations; abandonment of farm orchards; proliferation of commercial orchards; development of cold storage; development of packing operations; reduction in variety diversity; trend toward modern commercial characteristics; few dominant apple varieties; discovery of delicious apple; decline in pear popularity; few dominant pear varieties; adoption of low headed trees; the advent of synthetic fertilizers; adoption of pruning styles; increase in orchard tree spacing; advent of filler trees; improvement of irrigation systems; advent of fruit standards; development of pest control operations; and discovery of Golden Delicious apple.

During the period from 1946 to the present, American farm orchards disappeared and commercial orchards became highly sophisticated, technology-driven operations. Clonal, or cloned dwarfing rootstocks, rather than seedling rootstocks were developed and adopted by growers for many orchard species, producing smaller trees and dramatically increasing tree density within the orchard. Growers began using trellises or stakes to permanently support weak dwarf trees, and some used mechanical equipment for pruning, thinning, and harvesting. The number of varieties considered commercially viable dropped dramatically, leading to widespread monoculture in commercial orchards. After reaching a low point in the 1980s, the number of varieties grown in the last two decades has increased through the planting of new, rather than old, varieties (with a few exceptions). Today, universities are moving into the role of new variety development and patenting varieties for license to specific growers. Thousands of old fruit varieties are now extinct through lack of propagation and cultivation. The appearance of

the pre-World War II orchard has been transformed through the use of dwarf, tightly spaced, and short-lived fruit trees.¹⁰²

¹⁰² S. Dolan, *Fruitful Legacy: A Historic Context of Orchards in the United States with Technical Information for Registering Historic Orchards in the National Register of Historic Places*, (United States Department of the Interior, National Park Service, Olmsted Center for Landscape Preservation, Pacific West Regional Office-Cultural Resources, Park Historic Structures and Cultural Landscapes Program, 2009), 7-8.

Description of Manzanar-Grown Apple and Pear Varieties

Apple Varieties

Historical records indicate that several apple varieties were grown in the Owens Valley during the Manzanar Town Era. Varieties grown included Delicious (Red), Newtown Pippin, Yellow Belleflower, Esopus Spitzenburg, Winesap, and Arkansas Black. These were among the most popular commercial apple varieties in the early 20th century and were probably selected for their tolerance of hot growing conditions. In addition, numerous other apple varieties were grown in the region during this period, including Grimes Golden, Jonathan, Rhode Island Greening, Rome Beauty, and White Winter Pearmain.

Arkansas Black: This apple originated in Benton County, Arkansas ca. 1870 and is thought to be a seedling of Winesap. The Arkansas Black was named for its dark red or almost black color, while the skin is smooth and somewhat waxy. The white flesh is crisp and moderately juicy, which makes this variety suitable for cooking or cider. Ripening in October or November, Arkansas Black apples keep well and often gain flavor in storage.

Delicious: The Delicious or Hawkeye variety, today referred to as Red Delicious, was a chance seedling discovered in 1868 by an Iowa apple grower. Not popularized until the 1920s, this variety is characterized by a thick red skin, with darker red streaks, elongated shape and five nodes on

the bottom. Its flesh is white in color and has a crisp texture. Ripening in October, this apple variety is best for eating raw, rather than cooking.

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

Grimes Golden: The Grimes Golden apple originated in Brooke County, West Virginia in 1804 and was widely planted during the early 20th century. This apple may be a distant ancestor of the Golden Delicious and has a rich golden green color with some russetting. The flesh is characterized by a light cream color and the flavor is crisp and sweet with a hint of spice. This variety generally ripens from late September into October and has good keeping qualities. It can be used for cooking, eating, drying, freezing or making cider.

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

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

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

Rome Beauty: The Rome Beauty originated ca. 1816 in the Rome Township in Ohio. Well-known for its large size, beautiful appearance and keeping qualities, this apple was widely planted across the United States. The skin is a deep red and the flesh is greenish white in color, firm

and mildly tart. Generally harvest occurs between late September and November and can be used for baking, freezing or cider.

White Winter Pearmain: The White Winter Pearmain is also known as Cambellite and White Pearmain. The American origins of the White Winter Pearmain are vague. It is often speculated that this apple can be traced back to the eastern United States, developing in the mid 19th century, while others believe that it originated in England in 1200 A.D. It is characterized by a waxy light green skin that turns pale yellow. The yellowish-white flesh is crisp and juicy with a rich and aromatic flavor. Harvest generally extends from late September through October and is a good keeper.

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

Yellow Belleflower: Developing in New Jersey in the 18th century, the Yellow Belleflower is characterized by its lemon yellow skin and light pink striping. Of medium to large size, its white flesh is firm and crisp, while the flavor is sweet offset with a hint of tartness. Best for cooking and as a cider ingredient, this apple ripens in September and October. Be sure to shake this apple to hear the hollow rattle of seeds inside. Yellow

Belleflower is no longer grown commercially due to its poor keeping qualities. It is considered unusual to rare.

European Pear Varieties

A number of pear varieties were grown at Manzanar, including several European pear varieties and Asian pear. Today, Bartlett and Comice pear varieties are found in abundance in the park. Asian pear is found in the Hatfield Orchard Remnant. During the 20th century, Bartlett and Comice were the most commercially valuable varieties in California.

Bartlett: The Bartlett pear, also known as the Williams Pear, originated in England in 1765. It is characterized by a pyriform shape with a rounded bell on the bottom and definitive shoulder with a smaller neck or stem end. It has green to yellow colored skin with white flesh. The flavor and texture of the fruit continues to develop as the pear ripens from tart and crunchy to soft and mildly sweet. The Bartlett is great for eating raw, cooking, drying and canning and is also a good keeper. Harvest occurs between August and early September.

Comice: The Comice is formally known as Doyenné du Comice and was first propagated in France in the mid-1800s. The shape of a Comice is unique among varieties and is characterized by a rotund body with a very short, well-defined neck. The skin is green to slight-yellow in color and sometimes has a red blush covering portions of the skin surface. The

flesh is buttery and sweet and is excellent for eating fresh. The Comice matures later than other European pears, ripening in October.

Asian Pear

Asian pears are a round-shaped fruit that are firm, crisp and juicy when consumed ripe. Skin color can range from green to yellow-green to russet brown. The flesh is not as flavorful as European pears and does not turn brown when exposed to the air. Asian pears ripen on the tree, which is unlike European pears that ripen after harvest. At Manzanar NHS, an Asian pear tree exists in the Hatfield Remnant Orchard. This tree is a rootstock sprout, or a seedling, not a grafted variety. Varieties of Asian pear were not grown commercially during the Manzanar Town Era.

Asian Hybrid Pear Varieties

Kieffer: It is likely that the rootstock sprout or seedling Asian pear tree in the Hatfield Orchard Remnant was grafted with an Asian hybrid pear variety during the Manzanar Town Era, such as “Kieffer”. The Kieffer variety was bred in 1873 the United States, a result of crossing two species, the Asian pear, *P. pyrifolia* and the European pear, *P. communis*. American horticulturists hybridized Asian and European pears to attempt to blend the preferred characteristics of the two species: the succulence and melting flavor of the European pear, with the heat, drought and blight resistance of the Asian pear. By the early 1900s, the

Kieffer had become the most widely planted pear in orchards of the Southern states, due to its adaptation to high heat. The Kieffer was a commercially-grown variety in California during the Manzanar Town Era, though no record of this variety in the area is documented.

Glossary

Cultivar	The abbreviated term for a “cultivated variety.” A man-made variation within a species. The name of the cultivar follows the genus and species and is denoted by single quotation marks. The initial letters of the cultivar name are capitalized, e.g., <i>Pyrus communis</i> ‘Winter Bartlett,’ and the cultivar name is not italicized (see also: “variety”).
Clonal dwarfing rootstock	A commercial horticulture term for dwarfing rootstocks that are clones or genetically identical to each other. Dwarfing rootstocks are cloned to perpetuate desirable characteristics and to guarantee a rootstock’s ability to confer these characteristics upon the scion, such as extent of dwarfness, disease resistance, and youthful bearing of fruit.
Clone	The scion portion of a tree propagated by grafting. A clone is genetically identical to the parent. Clones, as opposed to seedlings, do not have genetic variation (see also: “scion”).
Cultural resource	Term for a building, site, district, object, or structure evaluated as historically significant.
Dwarfing rootstock	A rootstock that limits the height of a grafted tree to be shorter than the standard height (see also: “dwarf tree”).

Dwarf tree	A tree grown on a rootstock that limits its final height to be shorter than the standard height. Dwarf trees are generally classified as semi-standard, about two thirds of standard height; semi dwarf, about half of standard height; and dwarf, about one third of standard height.
Evaluation	National Register term for the process by which the significance and integrity of a historic property are judged and eligibility for listing in the National Register of Historic Places is determined.
Germplasm	The genetic material, especially its specific molecular and chemical constitution that forms the physical basis of heredity and is transmitted from one generation to the next. When applied to plants, it is the term given to seed or any vegetative material from which plants can be propagated.
Grafting	A method of propagation in which two different plants are joined together in order to take advantage of the special characteristics of each (see also: “rootstock” and “scion”).
Graft union	The joint between the two parts of the grafted tree which have grown together. When visible, the union appears as a line, scar, indent, or change in bark pattern on the tree trunk. The height of the graft union on the trunk has varied over time, and during the early 20 th -century, at ground level (see also: “grafting”).

Historic context	National Register term for an organizing structure for interpreting history that groups information about historic properties which share a common theme, common geographical area, and a common time period. The development of historic contexts is a foundation for decisions about the planning, identification, evaluation, registration, and treatment of historic properties, based upon comparative historic significance.
Historic integrity	National Register term for the unimpaired ability of a property to convey its historical significance. Integrity is a measure of the physical authenticity of a historic property or cultural resource.
Historic significance	National Register term for the value or importance of a historic property within the patterns of American history, in relation to a historic context. Significance may be in association with important events or persons, or for importance in design or construction, or for information potential.
Low headed tree	The term for a tree with a scaffold borne upon a short trunk. The head or point of attachment of the main branches to the trunk is set by pruning in the first or second year after planting. The practice of low heading or creating fruit trees with a low head on a short trunk, was used to control height in the transition from standard to dwarf trees between 1881 and 1945.

National Register of Historic Places

The Nation's official list of cultural resources worthy of preservation. Authorized under the National Historic Preservation Act of 1966, the National Register is part of a national program to coordinate and support public and private efforts to identify, evaluate, and protect our historic and archeological resources. Properties listed in the Register include districts, sites, buildings, structures, and objects that are significant in American history, architecture, archeology, engineering, and culture. The National Register is administered by the National Park Service, which is part of the U.S. Department of the Interior.

Rootstock

The term used in grafting to refer to the root system (see also: “scion”).

Scaffold

The framework of major branches growing from the trunk on a tree.

Scion

The term used in grafting to refer to the upper portion of the graft, typically the aerial portion of the grafted tree.

Seedling

A tree originating from a seed.

Standard tree

A tree grown on its own roots or grafted to a seedling rootstock that allows the tree to reach its natural height (see also: “dwarf tree”).

Variety

A naturally occurring variation within a species. The variety name is a Latin name written after the genus and species. The variety name is italicized along with the genus and species, e.g., *Prunus cerasifera atropurpurea* (see also: “cultivar”).

Vegetative Propagation

The process of producing a new plant from a portion of another plant, such as a stem or a branch. Also known as asexual reproduction, the process does not involve the mixing of genes from different parents as in sexual reproduction. The new offspring is genetically identical or a clone of the parent.

Whip

The term for an unbranched young tree typically one to two years old.

National Historic Landmark Nomination Form

**United States Department of the Interior
National Park Service**

For NPS use only

**National Register of Historic Places
Inventory—Nomination Form**

received

date entered

See instructions in *How to Complete National Register Forms*
Type all entries—complete applicable sections

1. Name

historic Manzanar War Relocation ~~Camp~~ Center

and or common Manzanar Internment ~~or Concentration~~ Camp

2. Location

street & number _____ not for publication _____

city, town _____ vicinity of Lone Pine

state California code 06 county Inyo code 027

3. Classification

Category	Ownership	Status	Present Use
<input type="checkbox"/> district	<input checked="" type="checkbox"/> public	<input type="checkbox"/> occupied	<input type="checkbox"/> agriculture
<input type="checkbox"/> building(s)	<input type="checkbox"/> private	<input checked="" type="checkbox"/> unoccupied	<input type="checkbox"/> commercial
<input type="checkbox"/> structure	<input type="checkbox"/> both	<input type="checkbox"/> work in progress	<input type="checkbox"/> educational
<input checked="" type="checkbox"/> site	Public Acquisition	Accessible	<input type="checkbox"/> entertainment
<input type="checkbox"/> object	<input type="checkbox"/> in process	<input checked="" type="checkbox"/> yes: restricted	<input checked="" type="checkbox"/> government
	<input type="checkbox"/> being considered	<input type="checkbox"/> yes: unrestricted	<input type="checkbox"/> industrial
		<input type="checkbox"/> no	<input type="checkbox"/> military
			<input type="checkbox"/> museum
			<input type="checkbox"/> park
			<input type="checkbox"/> private residence
			<input type="checkbox"/> religious
			<input type="checkbox"/> scientific
			<input type="checkbox"/> transportation
			<input type="checkbox"/> other:

4. Owner of Property

name City of Los Angeles

street & number 200 N. Spring Street

city, town Los Angeles _____ vicinity of _____ state California

5. Location of Legal Description

courthouse, registry of deeds, etc. Inyo County Courthouse

street & number _____

city, town Lone Pine _____ state California

6. Representation in Existing Surveys

title Manzanar War Relocation Center has this property been determined eligible? yes no

date July 30, 1976 federal state county local

depository for survey records National Register of Historic Places

city, town Washington _____ state DC

7. Description

Condition		Check one	Check one
<input type="checkbox"/> excellent		<input type="checkbox"/> unaltered	<input checked="" type="checkbox"/> original site
<input type="checkbox"/> good	<input checked="" type="checkbox"/> deteriorated	<input checked="" type="checkbox"/> altered	<input type="checkbox"/> moved date
<input checked="" type="checkbox"/> fair	<input type="checkbox"/> ruins		
	<input type="checkbox"/> unexposed		

Describe the present and original (if known) physical appearance

Manzanar War Relocation Center, an internment camp, is in Owens Valley, California, at the eastern base of the dramatic Sierra Valley and near Mount Whitney. The rugged mountain peaks form an impressive background for the dry desert of the campsite. To the east, the Inyo Mountains form the skyline. Formerly agricultural land, Owens Valley changed to its desert-like quality when the City of Los Angeles arranged to use the valley's water resources early in this century. In 1942, the U.S. Government set aside 6,000 acres in the valley for the establishment of a camp for the internment of persons of Japanese descent. Of this area, 640 acres were for the camp proper.

The 640-acre rectangle that comprised the 10,000-person capacity camp was originally surrounded by a barbed-wire fence with a watch tower at each corner and midway along each of the four sides. The fence and the towers are gone, but along the western side of the former camp the trace of the fence is visible by means of a row of posts, and the concrete foundation posts of the northwest tower remain.

At the main entrance of the camp, 1st Street, the inhabitants built two stone structures, each having a hint of Oriental architecture in its outline. The structure nearer the highway was a sentry post manned by Army personnel. The other was a police post manned by internees. On the walls of both, returning veterans of the camp have inscribed their names, often listing their room, building, and block numbers. The State of California has placed a landmark plaque on the sentry post.

In the beginning, the hastily built, one-story barracks were divided into rooms, each 20 feet by 24 feet and each housing a family. These barracks were arranged into 36 blocks of 16 barracks each. The dusty streets that separated the blocks can be traced in part. Common bathrooms, showers, laundries, and mess halls were located within the blocks. Here and there, concrete slabs with their drain holes and concrete posts that supported structures are found. Within several of the blocks, traces of former rock gardens survive. North of Block 23, near the orphanage site, are traces of the largest Japanese-style garden, Merritt Park, in the camp.

The southeast corner of the camp was the Federal administrative area with offices and staff housing. Ruins here are more extensive than elsewhere in the camp. Several rock walls and concrete slabs stand. Also, rock-lined flower circles and rock-lined paths are more prevalent than in the camp generally. One rock-walled circle marks the site of the camp flagstaff.

Northwest of the main entrance, and now having its own entrance from the highway, is the only substantial building remaining. This large metal building served as the school auditorium and is an Inyo County maintenance shop and garage.

8. Significance

Period	Areas of Significance—Check and justify below			
prehistoric	archeology-prehistoric	community planning	landscape architecture	religion
1400-1499	archeology-historic	conservation	law	science
1500-1599	agriculture	economics	literature	sculpture
1600-1699	architecture	education	military	social
1700-1799	art	engineering	music	humanitarian
X 1800-1899	commerce	exploration settlement	philosophy	theater
X 1900-	communications	industry	politics government	transportation
		invention		X other (specify)
				Wartime Internment Camp

Specific dates 1942-45

Builder Architect

Statement of Significance (in one paragraph)

On February 19, 1942, President Franklin D. Roosevelt signed Executive Order 9066, which authorized the Secretary of War to exclude citizens and aliens from certain designated areas as a security measure against sabotage and espionage. As a result, 110,000 persons of Japanese descent, most of them American citizens, were forcibly removed from their homes in California, Oregon, Washington, and Alaska, and removed to permanent camps far from the Pacific Coast. Manzanar was the first of these camps. Here, in a scrubby desert, 10,000 of these people were herded into barracks without being accused of any crime or given any hearing or a trial. Thus, a long history of anti-Japanese agitation and legislation on the West Coast reached a climax. Eventually, most Americans came to the conclusion that a grave injustice had been caused these people and their constitutional rights had been violated. Meanwhile, the vast majority of Japanese-Americans remained loyal to the country despite this great adversity. Manzanar is symbolic of this drastic event in American history, an event that is a reminder that a nation of laws needs constantly to honor the concept of freedom and the rights of its citizens.

Japanese-Americans

The arrival of the first Japanese immigrants in the United States in the 1880s was welcomed by West Coast promoters who were looking for cheap labor to replace Chinese after the Chinese Exclusion Act of 1882. At first, Japanese were slow to enter the United States, although a number emigrated to the Kingdom of Hawaii to work on the sugar plantations. When Hawaii became a United States Territory in 1898, many of these Japanese were free to move to the mainland, eventually causing Californians of an anti-Asian persuasion to view the newcomers as part of an Oriental threat to the social well-being of the country. At the same time, Japan was developing into an industrial nation at an astounding rate, which also alarmed some Americans of a "Yellow Peril."

The migration continued. In 1890 there were 3,000 Japanese in the United States. In 1900, 12,600 arrived, mostly from Hawaii. Between 1900 and 1908, 135,000 Japanese entered the country, many settling in California. Political and labor leaders, joined by newspaper publishers, began active campaigns against further immigration. Reacting to California's concerns, the Federal Government restricted Japanese immigration in 1908 ("The Gentleman's Agreement"), then prohibited it entirely in 1924. Also, Japanese who had entered the country were barred from citizenship. Meanwhile, California passed the Alien Land Law in 1913, which had the effect of preventing Japanese immigrants from owning land. Many Issei (first-generation immigrants), however, simply transferred their titles to their American-born children (Nisei).

9. Major Bibliographical References

SEE CONTINUATION SHEET

10. Geographical Data

Acreeage of nominated property 640 acres

Quadrangle name Lone Pine

Quadrangle scale 1:62,500

UTM References

A

04	397060	4066021
Zone	Easting	Northing

B

04	398040	4064080
Zone	Easting	Northing

C

04	3970000	4063070
Zone	Easting	Northing

D

04	3960001	4065070
Zone	Easting	Northing

E

Zone	Easting	Northing

F

Zone	Easting	Northing

G

Zone	Easting	Northing

H

Zone	Easting	Northing

Verbal boundary description and justification

SEE CONTINUATION SHEET

List all states and counties for properties overlapping state or county boundaries

state code county code

state code county code

11. Form Prepared By

name/title Erwin N. Thompson, Historian

organization Denver Service Center

date August 12, 1984

street & number 755 Parfet Street

telephone (303) 234-7509

city or town Lakewood

state Colorado

12. State Historic Preservation Officer Certification

The evaluated significance of this property within the state is:

national state local

As the designated State Historic Preservation Officer for the National Historic Preservation Act of 1966 (Public Law 89-665), I hereby nominate this property for inclusion in the National Register and certify that it has been evaluated according to the criteria and procedures set forth by the National Park Service.

State Historic Preservation Officer signature

title date

For NPS use only

I hereby certify that this property is included in the National Register

date

Keeper of the National Register

Attest:

date

Chief of Registration

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West of the camp and adjacent to it is a cemetery site. The inscription on a monument translates to English as the "Tower of Memory." Several burials are said to remain. At the northwest corner of the camp, the concrete footings of the hospital complex are found. Trees scattered along intermittent Bairs Creek in the southwest area offer some shade. Camp residents once had a picnic area here.

In 1945, the campsite was cleared of nearly all structures and returned to the administration of the City of Los Angeles in much the same condition as it had been before. The historically significant area is the 640 acres that comprised the camp at Manzanar and which was surrounded by a barbed-wire fence. It includes the cemetery site that lay outside the fence.

Outside the boundary of the camp, northwest of the northwest corner and near Shepherd Creek, is a 600,000-gallon water reservoir constructed by the U.S. Army Corps of Engineers. It is excluded from the recommended boundaries.

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Even before Japan's surprise attack on Pearl Harbor sentiment against Japanese in America had reached a high pitch. December 7, 1941, lit the flame. Secretary of the Navy Frank Knox, returning from a hasty inspection of Hawaii, informed the nation that the attack had succeeded because of the effective fifth-column work in the Islands. In fact, there was no fifth column in Hawaii. Lt. Gen. John L. DeWitt, commanding general of the Western Defense Command, wrote in February 1942:

The Japanese race is an enemy race and while many second and third generation Japanese born on United States soil, possessed of United States citizenship, have become "Americanized," the racial strains are undiluted. ... It, therefore, follows that along the Pacific Coast over 112,000 potential enemies, of Japanese extraction, are at large today. There are indications that these were organized and ready for concerted action at a favorable opportunity. The very fact that no sabotage has taken place to date is a disturbing and confirming indication that such action will be taken.¹

General DeWitt carried out Presidential Executive Order 9066, first attempting to have Japanese-Americans move from military zones voluntarily. State governments in the interior of the country generally refused to receive these people. Meanwhile, the Justice Department rounded up aliens who were considered potentially dangerous to the war effort. These included both German and Japanese individuals who were turned over to the Department's own internment centers.²

On March 18, 1942, the War Relocation Authority (WRA), first headed by Milton S. Eisenhower and then by Dillon S. Myer, was created to head the mass resettlement. The U.S. Army selected the first two camp sites, Manzanar in California's Owens Valley and Poston on the Colorado River in Arizona. The Army Corps of Engineers began construction at these two sites and eight other that were chosen by the WRA:

<u>Camp</u>	<u>Capacity</u>
Manzanar, California	10,000
Tule Lake, California	16,000
Poston, Arizona (3 units)	20,000
Rivers, Arizona (2 units)	15,000
Minidoka, Idaho	10,000
Topaz, Utah	10,000
Granada, Colorado	8,000
Heart Mountain, Wyoming	12,000
Jerome, Arkansas	10,000
Rohwer, Arkansas	10,000

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The Army oversaw the evacuation, which began in March and was completed by August 1942, and controlled most of the evacuees themselves until November when the War Relocation Authority took over camp administration. Manzanar, however, differed. It was filled to overflowing early in the process, its evacuees being moved there directly from their homes rather than being first sent to assembly centers, and the camp was turned over to the WRA on June 1, 1942.

The Japanese-Americans arriving at Manzanar found themselves in miserable circumstances. Rows of 20 by 100-foot, tarpaper-covered barracks were their living quarters. All other facilities were communal. One woman later recalled,

They used cheap pine wood for walls. The knots would fall off so we could see into a neighbor's room, and we could hear the shocking sound of voices, complaining, arguing bitterly. We weren't used to this. Our family was a gentle family. I was deeply upset because our daughter was listening, and I couldn't shut it out.³

By their own efforts, however, the internees gradually improved their living conditions as far as circumstances allowed. Doctors and medical supplies slowly improved in quality and quantity. After severe shortages, school supplies became more plentiful. The internees established a chicken ranch, a hog farm, and a pickle factory. For a time, the camp manufactured camouflage materials for the military.

A picture has sometimes been drawn of Japanese-Americans living passively in these camps throughout the long months of internment, accepting their fate calmly. In fact, episodes of turmoil and violence occurred in nearly all the camps. Manzanar was no exception. In December 1942, six masked men attacked a suspected informer for the camp administration. The latter identified one of the attackers who was jailed. A mass meeting was held to protest the arrest. Negotiations breaking down, an angry crowd regathered and vowed to "get" other suspected informers. The camp director ("project director") then called in military police. The crowd refused to disperse; the military police threw tear gas, then opened fire. Two men were killed and nine wounded. The suspected leaders of the riot were removed from Manzanar and eventually were resettled at Tule Lake, California, after that camp became a center for dissenters from all the others.

As 1942 ended, the War Department decided to establish a Nisei combat team for service in Europe. Volunteers had to pass a loyalty review by answering a questionnaire. This poorly written document resulted in deep divisions within the camps. Some people refused to answer questions concerning loyalty on the basis their legal rights were being denied. Deep and troubling rifts among the

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internees developed. In the end, men from Manzanar volunteered for the Army, and the all-Nisei 442nd Regimental Combat Team went on to glory in Italy and France. Another 3,700 Nisei served in combat areas in the Pacific War, mainly in intelligence functions, where they won the admiration of Army and Marine officers in the Central Pacific and elsewhere.

As the war progressed, more and more American leaders questioned the justification for continuing the relocation camps. As the months passed, more and more internees received permission to leave the camps, for military service, college, farm work, and the like. Manzanar's population declined to 5,000 in 1944; the camp was closed in 1945. Forty years later, Japanese-Americans continue to make annual pilgrimages to this scene of their incarceration.

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Footnotes

1. Commission on Wartime Relocation and Internment of Civilians, Personal Justice Denied, Report of the Commission on Wartime Relocation and Internment Of Civilians (Washington, U.S. Government Printing Office, 1982), p. 6.
2. Department of Justice internment centers are not to be confused with the ten relocation or internment camps to which the general West Coast Japanese population was moved. Since 1942, there has been much debate over the names of the latter camps. Although some Japanese-Americans prefer the term "concentration camps," the application of this term to the horrors in Europe make it unacceptable to other Americans. The U.S. Supreme Court refused to use the term in 1944. The term "internment camp" allows for confusion between the ten camps and the Justice Department's detention centers. "Relocation camp" is innocuous.
3. Fred Barbash, "In Desert Camp, Life Behind Barbed Wire," The Washington Post, December 6, 1982.

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Boundary Description

Starting at a point where Highway 395 meets a dirt road entering the highway from the west 2,950 feet southeast of the intersection of Highway 395 and Shepherd Creek, then in a straight line along the west side of Highway 395 southeast for a distance of 6,250 feet to where Highway 395 meets a dirt road entering the highway from the west, then in a straight line in an southwesterly direction along the north side of that dirt road and projecting the line beyond the turning of that road for a total distance from Highway 395 of 4,250 feet, then in a straight line in a northwesterly direction until it reaches the east side of a northwest-southeast dirt road, then continuing in a straight line along the east side of that road to its end, then in a straight line along the south side of a dirt road in a northeasterly direction to the point of beginning.

