Orchard Management Plan
Fort Ross State Historic Park

California Department of Parks and Recreation
Fort Ross Conservancy
National Park Service, U.S. Department of the Interior
Sponsored by Renova Fort Ross Foundation

Orchard Management Plan
Fort Ross State Historic Park

Sonoma County, California
April 2015

Prepared for:
California Department of Parks and Recreation
Sonoma Mendocino Coast District

Prepared by:
National Park Service, U.S. Department of the Interior
and
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Sponsored by:
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2015

Anyone who has a garden, park or orchard tree has an opportunity to ensure that it offers protection, brings beauty and bears fruit for future generations. In short, every one of us should aspire to be a forester.

- Gabriel Hemery

Contents

List of Figures

Chapter 2 Figures

Chapter 3 Figures

Chapter 4 Figures

Chapter 5 Figures

Chapter 6 Figures

Chapter 7 Figures

Appendix Figures

List of Tables

Chapter 2 Tables

Chapter 3 Tables

Chapter 4 Tables

Chapter 5 Tables

List of Maps

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This document is dedicated in recognition of the many volunteers and park staff members, without whose care the Fort Ross Orchard would not exist today.

1980-2015, in chronological order:

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John Smith, 1985.

INTRODUCTION

The Russian-American Company established Fort Ross in 1812 and in 1814 they planted the first fruit trees on the site. When the Russians left Fort Ross in 1841, almost 30 years later, over 280 fruit trees grew in two orchards on the hills behind the fort. After the Russian Era, immigrant ranchers and dairy farmers continued to plant fruit trees within the Russian Orchard and established new orchards on the land. Today, three resilient Russian Era trees, planted around 1820, grow in Fort Ross State Historic Park. In addition, 73 trees planted by ranching families beginning in the late 1850s grow in the park. The Fort Ross Orchard Management Plan recognizes the value of preserving these historic trees and offers guidance for maintaining and restoring the historic orchards and educating the public about the history of the site.

PROJECT BACKGROUND

California Department of Parks and Recreation (CDPR) acquired the Fort Ross Orchard property in 1976. Three years later, Linda Stainbrook, Interpretive Specialist with CDPR Interpretive Planning Unit, completed a report entitled *Fort Ross Orchard: Historical Survey, Present Conditions, and Restoration Recommendations*. This project builds upon the efforts of Stainbrook and the larger effort of CDPR in orchard preservation.

The National Park Service (NPS) has been working in cooperation with California Department of Parks and Recreation Archaeology, History, and Museums Division (AHM) since 2006 to provide training and guidance on the preservation of historic orchards. In 2008, NPS conducted a survey of California State Parks and found that 44 parks contained historic orchards or fruit trees. Two years later,

NPS led a workshop at Jack London State Historic Park for cultural resource and maintenance staff on historic orchard assessment and a training video was developed as a result. Finally, in 2012, NPS completed the *Historic Orchard and Fruit Tree Stabilization Handbook* for CDPR that provided specific guidance on preserving orchards within the California State Park system.

Fort Ross Conservancy (FRC), a cooperating partner with CDPR in the management of Fort Ross State Historic Park, a National Historic Landmark (NHL) property, recognized the value of the orchard at Fort Ross to the historic significance of the property and sought funding to stabilize the orchard and to complete an Orchard Management Plan. The Renova Fort Ross Foundation through the Fort Ross Conservancy generously provided funding for this project.

The Fort Ross Historic Orchard Restoration project, initiated by Susan Rudy and generously funded by Renova Fort Ross Foundation, is a multi-year, multi-phase project that provides much needed, time-sensitive care to protect and preserve this fragile living resource. FRC wishes to acknowledge Susan Rudy's expertise, professional network, volunteer coordination, and project management as the driving force that has guided this project from inception through execution. This project would not have been accomplished without Ms. Rudy's vision, dedication, and perseverance, and Fort Ross Conservancy is grateful for all that she has accomplished.

In addition to underwriting the Orchard Management Plan, the Renova Fort Ross Foundation has generously funded several phases of historic orchard preservation. Their support has included sponsoring the historic orchard conference, repairing the perimeter fencing, stabilizing trees, and funding extensive vegetation management. Fort Ross Conservancy is grateful for the opportunity to work with Renova Fort Ross Foundation to improve and protect the historic orchard.

ADDITIONAL RESOURCES

The broader historic contexts of agriculture and fruit

production are described in several documents that can be used as references to compliment this document. "The Historical Background of California Agriculture" in *California Agriculture* (Adams 1946) and *A Historical Context and Archaeological Research Design for Agricultural Properties in California* (California State Department of Transportation 2007) provide contexts of the agricultural development of California. *Fruitful Legacy: A Historic Context of Orchards in the United States* (Dolan 2009) and *Historic Orchard and Fruit Tree Stabilization Handbook* (National Park Service et al. 2012) contain a background of orchard development nationally and statewide, respectively. Finally, James Gibson provides substantial information on Russian agriculture in both Alaska and California in *Imperial Russian in Frontier America: The Changing Geography of Supply of Russian America, 1784-1867*(1976).

PROJECT TEAM

The National Park Service, California Department of Parks and Recreation and Fort Ross Conservancy worked in collaboration to create the Orchard Management Plan for Fort Ross State Historic Park. California Department of Parks and Recreation staff assisted in the fieldwork, provided GPS and GIS mapping support, and reviewed and approved the project to ensure it was consistent with CDPR management objectives and regulations. Jan Wooley, Historian III, ensured that the project was consistent with CDPR cultural resource management standards. Kathleen Kennedy, Historian, and Gary Shannon, Russian River District Landscape Architect, assisted with fieldwork and provided project guidance and review. Patrick Riordan, Archaeologist, conducted all GPS data collection and John Fraser, Historian, provided GIS mapping support. Glenn Farris, former CDPR Historical Archaeologist and expert on Russian-American history, Lynn Rudy, local author and Historian, and Felisa Rogers, independent Historian, reviewed drafts of the project.

In addition to providing funding for the project, Fort Ross Conservancy organized logistics for the project and provided assistance. Sarah Sweedler, Fort Ross Conservancy

President and CEO, participated in project meetings and reviewed the document drafts. Susan Rudy, Fort Ross Conservancy advisor and lead orchard volunteer, initiated the project, served as project liaison, and organized the fieldwork. Sarjan Holt, FRC Operations Manager, provided research and graphic design support. The National Park Service, the federal agency responsible for setting national standards for historic preservation, provided technical project assistance. Susan Dolan, National Park Service Cultural Landscapes National Program Manager, provided subject matter expertise and project guidance. Julia Yu, NPS Cultural Resources GIS Specialist, designed the document layout. Keith Park, Horticulturist and Preservation Arborist at John Muir National Historic Site, and Corinna Welzenbach, Landscape Historian at Turnagain Design and Consulting, served as the principal authors of the study.

STUDY BOUNDARIES

The Orchard Management Plan addresses all of the cultivated fruit trees within Fort Ross State Historic Park. These fruit trees include trees planted in the Russian and Ranch Eras, and after CDPR gained management of the land. Trees are located within five areas of the park. The Russian Orchard, Call Orchard, and Benitz Orchard are distributed on the foothills to the north of the Fort Ross stockade compound. The Call House and Picnic Area fruit trees are located adjacent to the Call House and near the site of the former Turk House. Finally, two trees grow within the stockade compound adjacent to the Rotchev house. This report focuses on the Russian Orchard, but also documents the other orchard locations and provides recommendations for management of all historic fruit trees in the park.

METHODOLOGY

Project partners performed historical research and site surveys to gather information for the Orchard Management Plan. Research on the history of the orchard was conducted from April to July of 2014 utilizing both primary and secondary sources. Primary source documents were obtained from the Fort Ross Conservancy Library, the

Bancroft Library at the University of California Berkeley, the University of Washington Special Collections, and the Library of Congress Meeting of Frontiers website. Secondary sources in Russian were consulted as were multiple sources translated from Russian language originals.

The project team conducted fieldwork during three site visits in April, May, and June of 2014. During the fieldwork, the project team and volunteers inventoried and mapped all of the cultivated fruit trees within Fort Ross State Historic Park. The Tree Condition Assessment Field Form (Appendix) was utilized to assess the condition of each tree. In addition, CDPR staff collected a GPS location for each of the trees. Soil samples were taken from four locations and fruit tree varieties were determined through visual identification and genetic testing at National Clonal Germplasm Repositories.

In September 2014, the project team conducted a webinar workshop to identify a range of historic preservation treatment options for the orchard. In addition to the above mentioned project team, Breck Parkman, CDPR Senior Archaeologist, and Charlie Pepper, Cultural Landscape Preservation Maintenance and Education Manager at the NPS Olmsted Center for Landscape Preservation, participated in the workshop. Workshop participants provided feedback on the various treatment options. Based on the input from the webinar, the project team refined the treatment alternatives described in Chapter 7.

OBJECTIVES

The central objectives of the Fort Ross Orchard Management Plan are focused on education and interpretation, baseline documentation, and maintenance/treatment recommendations. Resource managers, maintenance and interpretive staff, and volunteers can utilize the document to support their specific goals.

Education and Interpretation: *The historical information and treatment recommendations found in the Orchard Management Plan can be used to aid in interpretation.* Interpretive staff can use this document to prepare public presentations and tours. In addition, the

text, quotes, and images can be amended to be included in printed interpretive materials such as signage, brochures, and pamphlets. Finally, treatment recommendations offer guidance to developing interpretive features within the orchard.

Baseline Documentation: *The Orchard Management Plan provides a thorough description of the history of the orchard and inventories the physical features of the contemporary landscape*. Resource managers can use the documentation of the orchard history and the evaluation of its historic significance to update the National Historic Landmark nomination and to make decisions about the preservation of the orchards. Maintenance staff and volunteers can use the baseline documentation of the existing conditions in the orchard to identify individual trees and prioritize maintenance activities. In addition, resource managers can utilize the baseline documentation to access changes in the condition of the fruit trees over time.

Maintenance and Treatment Recommendations: *The Orchard Management Plan offers guidance in the stabilization and maintenance of existing trees and offers conceptual treatment options for the Russian Orchard*. Maintenance staff and volunteers can use the stabilization and maintenance recommendations as a guide to plan and conduct work within the orchard. Resource managers can utilize the treatment recommendations to make long term preservation decisions and to implement restoration and rehabilitation projects.

FORMAT

The Fort Ross Orchard Management Plan consists of seven sections: *Statement of Significance, Physical History, Existing Conditions, Analysis and Evaluation of Integrity, Stabilization, Cyclic Preservation Maintenance, and Treatment*. The Statement of Significance (Chapter 1) summarizes the historical significance of the orchards and fruit trees and provides recommendations for updating the National Historic Landmark Nomination. The Physical History (Chapter 2) describes the orchards during the

Russian and Ranch Eras and includes the historic context of fruit tree production in Spanish America and California. The Existing Conditions (Chapter 3) summarizes the present state of the individual trees within the orchard areas. The Analysis and Evaluation (Chapter 4) provides an assessment of the historic integrity of the orchards based on a comparison of the present state of the orchards with their historic tree composition and layout. The Stabilization (Chapter 5) and Cyclic Preservation (Chapter 6) section serves as a manual for orchard care. Finally, the Treatment (Chapter 7) relies on the Analysis and Evaluation of Integrity and the outcomes of the planning workshop to define conceptual level restoration and rehabilitation treatment plans for the Fort Ross orchards and fruit trees.

CHAPTER 1

STATEMENT OF SIGNIFICANCE

The history of the orchards at Fort Ross encompasses two eras: the Russian Era (1812-1841) and the Ranch Era (1842-1976). Both the Russian and Ranch Era orchards and fruit trees in Fort Ross State Historic Park contribute to the significance of the property. The Russian Era fruit trees and landscape of the Russian Orchard are associated with the Russian-American Company's colonization efforts and Fort Ross National Historic Landmark. The Ranch Era fruit trees and orchards are associated with the Call/Benitz Ranch Historic District, a property significant at the state level as a largely intact example of a 19th and 20th century ranching landscape.

FORT ROSS NATIONAL HISTORIC LANDMARK

Fort Ross was designated a National Historic Landmark in 1961. The Commander's House, also known as the Rotchev House, located within the stockade, was designated as a separate National Historic Landmark in 1970. The Rotchev House is one of only four remaining Russian Era buildings in the United States and the only remaining Russian Era building outside of Alaska.

National Historic Landmark Criterion One applies to the Fort Ross National Historic Landmark. This criterion is applicable to "*properties that are associated with events that have made a significant contribution to, and are identified with, or that outstandingly represent, the broad national patterns of United States history and from which an understanding and appreciation of those patterns may be gained*" (National Park Service 1999, 21). Fort Ross National Historic Landmark is significant for its association

with the broader Russian colonization of America. From the second half of the 18th century until 1867, Russian fur trading companies established settlements and fur-hunting posts around the North Pacific from the Kuril Islands to California, but mainly based in Alaska. The fur companies widely employed Alaska Natives and the Russian Orthodox Church was instrumental in creating the first written forms of several Alaska Native languages.

Beginning in 1803 the Russian-American Company, initially in conjunction with American sea captains, extended their hunting of sea mammals as far south as the coast of Baja California. The Russian-American Company also sought to establish itself on the California coast north of the land then colonized by the Spanish which only extended to San Francisco Bay. The period from 1812 to 1841 represents the Russian occupation of Fort Ross. In 1812, the Russian-American Company established Fort Ross on the coast of northern California as a food production site for the Alaskan colonies and as an outpost for sea mammal hunting. The Russian-American Company employees constructed the fort and the surrounding structures and planted vegetable gardens, grain fields, and orchards. The central compound consisted of a stockade surrounding upper level employee housing and supply buildings. The Russian-American Company built a blacksmith shop, a tannery, a brickyard, a dairy, a ship building yard, two threshing floors, and two windmills outside of the stockade. Alaska Native, California Native American Indian, Russian, and Creole (Russian and Alaska Native) employees also established family housing sites. While Fort Ross was the primary Russian settlement in California, the Russian-American Company also founded ranches in at least three other locations, maintained a hunting camp on the Farallon Islands, and established a rudimentary seaport at Bodega Bay (Port Rumiantsov).

RUSSIAN ERA ORCHARD AND FRUIT TREES

According to a 2007 California State Department of Transportation historic context, agricultural properties that were established in California prior to the Gold Rush are "*rare, minimally understood, and generally have a high*

potential to yield [archaeological] data" (1-2). Fort Ross is significant among the pre-Gold Rush agricultural properties for being the first non-Spanish European agricultural establishment in California. Over fifty vegetable plots, multiple grain fields, and two orchards were established in the adjacent landscape up to two miles from the fort. The Russian-American Company employees planted over 280 fruit trees in two orchards one-half mile to the north of the stockade complex. The Russian-American Company acquired the majority of fruit tree seeds and cuttings used to establish the orchard from the Spanish missions in California. The orchards were used to provide food for the colony with the hopes that the fruit could eventually be brought to Alaska for the Russian settlements there.

Three Russian Era trees remain at the orchard site. The Capulin cherry trees, native to Mexico and Guatemala, were obtained from the mission at Santa Cruz and were planted around 1820. The trees are historically significant as the only living horticultural specimens from the Russian Era in California. The Capulin cherry trees are among the few extant resources from the Russian Era and are the primary physical expression of the Russian settlement's agricultural history. In addition to the historic trees, an archaeological site adjacent to the orchard represents the probable location of a Russian Orchard house and two other archaeological sites could have been used by California Native people who worked in the orchard.

NHL BOUNDARY

The current boundary for the Fort Ross National Historic Landmark contains 1.8 acres encompassing "the original and non-intruded upon area of the original fort site" (National Register of Historic Places, Fort Ross). The site boundary description, written in 1977, contains inaccurate dimensions that do not represent the size of the current stockade compound or the historic size of the fort. In the future, when the NHL boundary is updated, additional features, outside of the fort compound, should be included. Particularly, the Russian Era orchard site and the extant Capulin cherry trees contribute to the significance of the

Fort Ross landscape as a whole and should be included in the NHL boundary. The Russian Era orchard fruit trees express the practice of agriculture that was essential to the foundation of the settlement and are part of the limited original fabric of the site. In addition, numerous archaeological sites representing Kashaya Pomo and Alaska Native residential areas are located in the surrounding landscape outside of the current NHL boundary, as are other locations utilized for Russian Era agricultural activities. The findings from the Orchard Management Plan can be used to update the National Historic Landmark Nomination and to revise the boundary to include the larger area of historic development. The revised NHL boundary (Map 1.1) could be extended to include the agricultural areas depicted in the 1817 map (Figure 2.4) and the probable boundary of the orchard during the Russian Era.

BENITZ/ CALL RANCH HISTORIC DISTRICT

The Ranch Era property or Benitz/Call Ranch is listed as a Sonoma County Landmark. The ranch was utilized for cattle ranching, sheep ranching, and as a dairy farm from before the Gold Rush until 1976. National Register Criterion A applies to the Benitz/Call Ranch. Criterion A is pertinent to properties "*associated with events that have made a significant contribution to the broad patterns of our history*" (National Park Service 1990, 12).

RANCH ERA ORCHARDS AND FRUIT TREES

The Ranch Era orchards and fruit trees at Fort Ross are contributing features to the Benitz/Call Ranch Historic District. Cattle ranching, dairy farming, potato growing, and sheep ranching were the most prominent agricultural activities at the Benitz (1843-1867) and Call (1873-1976) ranches. However, as was a typical practice on coastal ranches, the families planted fruit trees and harvested the fruit for domestic and commercial use. The Benitz family expanded fruit production by installing a large orchard with 42 apple varieties to the west of the Russian Orchard. The Calls planted an apple orchard on Sea View Road (outside of the boundary of the state park) and a plum, apple, cherry,

0 0.25 0.5 Miles

Proposed National Historic Landmark Boundary
Fort Ross Orchard Management Plan

Map 1.1

and walnut orchard up a small logging road east of the Russian Orchard. In addition, the Calls established trees around their housing compound and planted new trees in the Russian Orchard.

The orchards at Fort Ross never took on the characteristics of commercial orchards that became prominent in California in the late 19th and early 20th centuries. Instead, the Ranch Era orchards bear the characteristics of 19th century homestead orchards. The mixed varieties of apple and pear trees are indicative of the expansion of fruit tree varieties available in California from the 1850s until the early 20th century. The trees are full-size, indicating they were grafted onto seedling rootstock. In addition, the historic practice of grazing in the orchard and a lack of pruned scaffolds shaped the form of the Ranch Era trees. These characteristics suggest that the Ranch Era activities on the lands of Fort Ross did not represent a professional commercial orchard operation.

The fruit trees that presently grow in Fort Ross State Historic Park express the long and varied agricultural history of the site. While the orchard areas reflect varied levels of significance (state and national) and periods of significance (Ranch Era and Russian Era), they represent a continuum of fruit production on the landscape. The following chapter details the history of fruit production at Fort Ross.

CHAPTER 2

PHYSICAL HISTORY

The Russian-American Company planted the first peach tree at Fort Ross in 1814. From 1814 until the present, fruit trees have been cultivated on the land associated with Fort Ross. The Russian Era at Fort Ross extends from 1812, when the Russians settled the site until 1841 when they withdrew from the settlement. During the Russian Era, the Russian-American Company planted 280 fruit trees in two orchards above Fort Ross. The Ranch Era began with the purchase of Fort Ross by John Sutter when Mexico controlled California and spans to 1976. During the Ranch Era, the Russian trees declined and two new orchards were planted to the east and west of the Russian Orchard. The surviving trees represent the living history of Sonoma County.

By design, Fort Ross was remote and isolated, but at the same time it was on the border of two empires that together nearly encircled the globe. While the Russian settlement is unique to California, the agricultural work conducted at Fort Ross can be compared to the farming conducted at the Russian-American Company settlements in Alaska and the orchards and gardens developed at the Franciscan missions of California.

This plan examines the influence of Franciscan mission farming practices on the development of the Fort Ross area. The physical history section describes the development of the orchards at Fort Ross and is based on documentation of plant procurement, orchard management, and the changes of physical features of the orchard over time. This information is utilized to evaluate the integrity of the historic resources in the landscape and to develop appropriate conceptual treatment recommendations. The physical history can also

be used independently to educate the public about the history of the orchards.

CALIFORNIA NATIVE PEOPLE AND FOOD PROCUREMENT

Native Americans were cultivating plants long before first contact with European colonizers. In Mexico, indigenous people domesticated plants as early as 5600 years ago. By the time of first contact, Aztecs and other groups throughout Mesoamerica and South America had domesticated over one hundred plants (Dunmire 2004, 32-33). Agriculture spread into the area now known as the southwestern United States. In California, the Quechan (Yuma), Halchidhoma, Mojave, and Paiute practiced agriculture in the Colorado and Owens River Valleys.

Native tribes throughout the rest of California were non-agrarian. Although these groups did not practice agriculture, they had an intimate knowledge of plant distribution and use, and they practiced forms of habitat manipulation. For example, many indigenous groups used prescribed burning to promote specific plant growth and enhance productive habitat zones. In addition to burning, aboriginal people in California distributed plant seeds, transplanted plants, developed irrigation systems, pruned plants, and tilled the soil (Blackburn and Anderson 1993, 19). These non-agricultural land management practices indicate a complex relationship with plant ecosystems.

The Kashaya Pomo occupied the coast in the area of Fort Ross at the time of colonization and in both the Russian and Ranch Eras. Their territory extended from Duncan's Point to the Gualala River mouth. They had a relatively high population density, with numerous villages and camps located along the coast and directly inland from the Russian River to the Gualala River (Lightfoot, Wake, and Schiff 1991, 45-46). The Pomos harvested wild celery, onion, potato, oats, acorns, seaweed, and numerous other plants. They utilized plants for food, medicine, clothing, and basketry, and they developed rituals associated with plant collection.

RUSSIAN AND SPANISH FRONTIERS

Fort Ross was located at the meeting point of the Russian and Spanish colonial expansion. The Russian eastward expansion across Siberia, Far Eastern Russia, and into Alaska was driven by the search for fur and the flourishing fur trade with China. Russian expeditions into America began in 1732 when an expedition led by Mikhail Gvozdez reached Alaska and ended in 1867 with the sale of Alaska to the United States. Spanish colonization in America was more extensive and enduring. It began 240 years prior to the Russian arrival with Columbus's first voyage in 1492. Spain sought to settle the continent, spread religion, and extract resources. Their empire eventually spread from California to Tierra del Fuego.

The mission period in California, from 1769 to 1833, overlaps with the Russian colonization of Alaska and the establishment and occupation of the settlement at Fort Ross (1812-1841). Spain began expanding its empire north into Alta California[1] in 1769, after learning of Russian activities in the North Pacific. The Spanish colonization of Alta California spanned from San Diego to Sonoma, and began with the construction of San Diego mission and presidio. By 1823, the Spanish had built twenty-one Franciscan missions, four presidios, and three pueblos.

The Spanish westward colonization across Central America and into Alta California is significant to the history of the Fort Ross Orchard. By the time the Russians settled Fort Ross in 1812, the Spanish had developed gardens and orchards throughout their colonized areas of the New World. The established gardens and plant trade that reached into the Alta California missions provided the primary inspiration and sources of plant material (cuttings and seeds) for the establishment of an agricultural settlement at Fort Ross.

1 The territory that became California, Nevada, Utah, Arizona and part of Colorado and Wyoming but generally used to refer to the Spanish settlements in California north of Baja California.

Figure 2.1: *Border of the Russian and Spanish Frontiers (adapted from Lightfoot, Gonzalez, and Schneider 2006).*

SPANISH COLONIZATION AND AGRICULTURE

Early Spanish colonizers brought plant material on their ships to establish agricultural settlements when they sailed for the New World. Seeds and cuttings of lemon, olive, orange, sugarcane and grape from Spain and the Canary Islands were included on the cargo of Columbus's second voyage (Dunmire 2004, 89). By the 1530s, apples, pears, and olives had been introduced to Mexico (Dunmire 2004, 128). Horticulture was also a central concern of Spain's colonization of the California coast.

The Franciscan missions led the introduction of European plants into the New World. Priests were students of agriculture and passed this knowledge on to their converts. Franciscan missions produced grafted trees and taught Native people grafting and other agricultural techniques. This practice was continued in California. Seeds of vegetables, beans, and flowers were brought on the first ships that established the San Diego Mission in 1769 (Brown 1988, 7).

Some missionaries came to Alta California from the Franciscan missions at Sierra Gordo in central Mexico. The friars from Sierra Gordo had cultivated gardens and orchards and were skilled in the art of agriculture when they arrived in Alta California. The libraries of the missions contained guidebooks to agriculture and the friars experimented with the best methods of agriculture for the soil and climate of California (Hardwick 2005, 2).

Agriculture work was an essential function of the Alta California missions and all but three contained an orchard and gardens. The mission orchards of Alta California ranged in size from three to forty acres and were surrounded by adobe walls or hedges to protect the crops from livestock, wild animals, and thieves (Brown 1988, 6). By 1778, the Alta California missions had established grapes for wine production. Grapes were the most extensively planted fruit in Alta California and mission vineyards ranged in size from seven to 120 acres. By 1792, about 5,000 fruit trees had been planted in the California missions (California State Board of Horticulture 1892, 33). Apricot, cherry, peach, plum, lemon, lime, orange, apple, fig, olive, pear, pomegranate, and quince trees were all introduced to Alta California before 1795. San Jose's mission had 600 pears trees in addition to apple and peach trees (Brown 1988, 8). In 1826, the San Gabriel orchard and vineyard contained 2,333 fruit trees (oranges, figs, pomegranates, peaches, apples, limes, pears, and citrons) and over 160,000 grape vines (Brown 1988, 9).

The mission orchards in Baja California provided the majority of the imported fruit seeds and cuttings for the Alta California missions. Expeditions that stopped at the missions also provided new plant material. The establishment of the mission gardens along the coast took

place at a time when nautical voyages were expanding the horticultural selections in the ornamental gardens and agricultural lands worldwide. Many of the round-the-world voyages contained passengers with an expertise in botany who wrote detailed descriptions of the local flora and brought cuttings and seeds back to their home country for propagation.

In 1786, two French ships under Jean François de La Perouse reached Monterey. Aboard one of the ships was Mr. Collignon, one of King Louis XVI's gardeners. In addition to acquiring new plant varieties, Mr. Collignon was tasked with distributing plants from Europe to ports of call. The French ships contained a large variety of seeds, as well as living trees and vines. Seeds of apple, pear, peach, apricot, plum, cherry, almond and others were included in its inventory. The live plants included Montmorency cherry, Black Heart cherry, White Heart cherry, olive, quince, fig, and chestnut trees. The ship traded potatoes and grains for vegetables and also likely provided the mission with new fruit tree stock.

RUSSIAN ACCOUNTS OF SPANISH MISSION ORCHARDS

Several Russian ships traveled to California during the mission era. Russian ships first visited California when exploring the coast. Later ships came to establish the Fort Ross settlement and bring supplies. In addition, several Russian round-the-world expeditions stopped at mission settlements. Russian observers who either lived at Fort Ross or were passengers on expeditions wrote detailed descriptions of California mission orchards and gardens. These descriptions are pertinent to the history of the orchard at Fort Ross because they demonstrate the extent of agriculture in California when Fort Ross was established. They also provide evidence of the availability of specific fruit varieties, the Russian interest in fruit production, and the relationship between Russian explorers and Spanish/ Mexican colonizers. The Fort Ross orchard benefited from information that was gathered at the missions. Mission practices likely influenced the placement of the orchard and the practices of fruit production at the settlement.

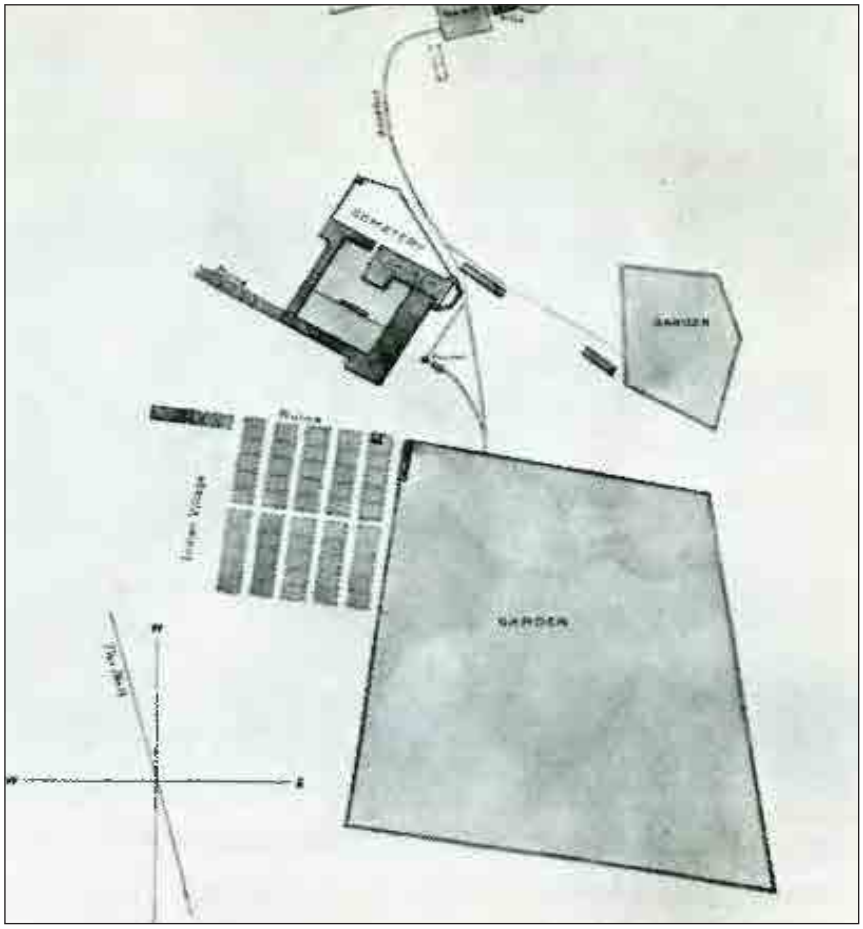


Figure 2.2: *Plan of Mission Santa Barbara, 1854 (Brown 1988, 4).*

In 1818, F.F. Matyushkin, who was aboard the ship Kamchatka, wrote that their party visited an orchard at Carmel Mission "where for the first time in a long time we partook in European fruit—apples, pears" (Istomin, Gibson, and Tishkov 2005, 305). Ships were not stocked with fresh fruit and thus the European fruit was a welcome source of vitamins and a reminder of home. Another passenger on the Kamchatka, F.P. Litke, described agricultural activity at the mission:

> *The mission has a quite a large orchard, garden and ploughed field, which are all worked by the Indians. In the orchard there is an abundance of various flowers and fruit trees, such as apple, pear, peach, and others; but, in the words of our interpreter, here they don't grow very well, and he ascribes this to the fact that from the nearness of the sea the soil contains many salt particles. However,*

> *this poor harvest must, of course, be seen in relation to the usual harvest in California (Northern [Alta]), which is perhaps one of the most fruitful lands on the globe, and the San Carlos harvest would be considered large in many countries lying in the same latitude.* (Istomin and Gibson 2014, 377)

Like Matyushkin, Litke was impressed by the productivity of the California landscape. He also seemed interested in the factors influencing the productivity. As Fort Ross was already established at this time, he may have considered the information gained about agriculture at the missions in relationship to how it would be useful to the Russian settlement.

Two years later, Nicolai Dmitrievich Shishmarev, a warrant officer in the Imperial Russian Navy who visited California aboard the Blagonamerenny from November 1820 to February 1821, was also awed with the varieties grown in California. Describing the gardens of the San Jose Mission, he wrote, "All varieties of apples, peaches, grapes in very good condition, are made into rows, decorative beds, quite artful flower gardens" (Istomin, Gibson, and Tishkov 2005, 390). He depicts a well-organized and managed orchard with both edible and ornamental plants. A fellow traveler on the Blagonamerenny, Captain-Lieutenant Mikhail N. Vasilyev, wrote another description of the San Jose Mission after a visit in February of 1821:

> *An orchard also adjoins the first building from the church, and there are fruit trees (apple, pear) and flowers in it; in the garden they plant cabbage, pumpkins, pota[toes], onions, garlic, radishes, peppers, and watermelons. We found the orchard at Mission San Jose in the best order; although it was wintertime, the farming could be judged. They grow grapes, from which they make red wine. We drank this year's vintage, made in September, and we cannot say how it is after it ages but now it is rathe[r] sweet. They have planted olive trees, whose fruit has the best taste of al1. They do not seem to exert much effort on garden vegetables, for we did not find enough food at the four missions for both sloops. At first we got some, but then it was impossible to get any at all, except apples,*

> *which were abundant at Santa Clara and San Jose. Even the best kind had little taste and were mostly coarse and woody.* (Gibson 2013,176)

Vasilyev's account is similar to Shishmarev's in that he found the gardens at San Jose to be in good condition, with both fruit and ornamental plants. He also describes how the Russian ships visiting the Spanish missions traded goods for food, including fresh fruit and vegetables. His comment about the "coarse and woody" apples could indicate that some of the apple trees at the missions were grown from seed rather than as grafted varieties[2].

In addition to these specific accounts of mission orchards, several Russian travelers wrote detailed reports about California both as official documents and to be published for the general public. These reports included description of the natural environment of California, the Native people, and the mission activities. The accounts provide a general overview of the agricultural conditions throughout Alta California at the beginning of the 19th century. Below are descriptions written by Mikhail N. Vasilyev in 1821, Kirill Khlebnikov in 1828, and Egor Chernykh in 1841. Both Khlebnikov, the second ranking official for the Russian-American Company's American settlements, and Chernykh, an agronomist at Fort Ross, had a specific interest in agriculture. They also were likely examining the agricultural activities in California as a whole in order to gain insight into plant availability and horticultural practices for the settlement at Fort Ross.

M.N. Vasilyev compiled his notes about California into a report entitled "Answers to questions about nature, population, economics and the political situation in California." Answering the question "What does California produce in agriculture?", he wrote, "Fruit trees, such as apple, pear, peach (which the Spaniards [Californios] call *durazno, Persicum duratinum*, which they say is quite another species of this plant), cherry, fig, olive, grape, Capulin [*Prunus capuli*] (which the Spaniards call a species of cherry), plum, and tomatoes grow in the orchards." (Gibson 2013, 200). Vasilyev goes on to describe the vegetables, herbs,

2 Seedling apples are best suited for cider-making rather than eating raw.

and ornamental plants grown at the missions. His specific reference to the Capulin cherry is significant to the orchard at Fort Ross. While other sources indicate that Capulin cherries were grown in the Mission Era, this document provides the first specific reference to a Capulin cherry by a Russian in California, offering additional provenance to the Russian Era Capulin cherries grown at Fort Ross.

In 1828, Khlebnikov, who wrote detailed descriptions of the Russian-American Company's activities in America, described fruit production in California:

> *Fruit is grown abundantly throughout New California. Apples of various kinds, pears, peaches, and figs are characteristic of the whole country, but in the southernmost parts, beginning at Santa Barbara, a lot of grapes are grown, as well as lemons, [sweet] oranges, sour oranges, pomegranates, citrons, and platans [plane trees, or sycamores]. Fruit orchards are adorned with rose bushes, pinks, and stocks [gillyflowers]; many medicinal plants are cultivated.* (Gibson 2013, 335)

Khlebnikov was actively involved in both planting and documenting the orchard at Fort Ross, and his descriptions of the orchard indicate an attention to agricultural detail. It is likely that early on the Russians became aware of the specific climate of Fort Ross and thus did not introduce the varieties of fruit from the more southerly missions that were adapted to warmer regions, such as the citrus fruits Khlebnikov mentions.

Finally, Chernykh described the orchards of California at the end of the Russian Era in 1841:

> *Orchard keeping in California is used on a small scale. Small orchards of fruit-bearing trees and vineyards are found only in the Missions. When the orchards were owned by the missionaries they were kept in good order; but now, under administrators (managers), everything is gone wild and, in places, destroyed. When private persons have orchards and vineyards, they are so insignificant as to deserve no attention.*
>
> *The fruits which grow to considerable size are: apples,*

Table 2.1: Fruit Grown at California Missions Corresponding to the Species Planted at Fort Ross *(Hardwick 2005, 107-109)*

Common Name	Spanish	Species and Variety	Year introduced to Alta California
Apple	*Manzana*	*Malus pumila (=Malus sylvestris)*	1792
Cherry	*Cereza*	*Prunus avium* (Sweet cherry- Black heart, White heart) *Prunus cerasus* (Sour cherry- 'Montmorency') *Prunus salicifolia* (Capulin Cherry- native to Mexico)	Between 1769 and 1822
Grape	*Grano, Pasa (raisin), Vino, Aguardiente, Angelica*	*Vitis vinifera* Criolla and Monica types: 'Alba,' 'Albilla,' 'Diego Rubra,' 'Molar,' 'Paragrande,' 'Torrontes' Hybrid grapes- V. *vinifera* and native grapes (*Vitis califonica* and *Vitis girdiana*)	1769
Peach	*Melocotón, Durazno*	*Prunus persica* 'Melocotone,' 'Priscos'	1792
Pear	*Pera*	*Pyrus communis* 'Presidenta,' 'Pana,' 'Lechera,' 'Pera de San Juan,' 'Bueno Cristiano'	1769 (San Gabriel Mission)
Quince	*Membrillo*	*Cydonia oblonga var. Lusitanian* (Portugal Quince) *Cydonia oblonga var. maliformis* (Apple or Orange Quince)	-

> *pears, peaches, apricots, quince, plums, etc. In general, fruits are coarse. Blue grapes are cultivated and yield good harvest and good taste. Vine slips are stuck into the ground, and some of them bear fruit in 3 to 4 years. Local grapes make good wine, but in small quantities and does not keep well.* (Chernykh 1967, 27)

Chernykh's account indicates how the mission orchards fell into disrepair after secularization. He also describes the fruit as coarse, which again could indicate seedling, rather than variety trees.

These descriptions emphasize that Russian expedition ships frequently visited Spanish missions and traded with the Spanish for food and resources. Although the Spanish government believed that Russians were usurping their territory, individual groups of colonizers from both countries had close and often cordial interactions. They learned from each other about the ethnic, economic,

ecological and agricultural landscape of California, a region so distant from the centers of the imperial governments where decisions about territorial rights were being made.

The Mexican government took control of Alta California in 1822 during the Mexican War of Independence, and the missions were secularized after 1833. Though the Spanish Mission period was short-lived, the missions had a major impact on California agriculture and a seminal influence on the development of Fort Ross. Mission authorities conscripted 30,000 California Native American people and cultivated several thousand acres of land (Dwinelle 1863, 44). The majority of plant material for the orchard at Fort Ross came directly from Spanish missions in Alta California, and the mission orchards provided an example of large scale fruit production that served as a practical model for fruit production in California and an inspiration for the development of the orchard at Fort Ross.

RUSSIAN COLONIZATION

Beginning in the second half of the 18th century, merchants, who had traded fur in Siberia and the Russian Far East, sent expeditions to Alaska in search of sea mammals. The expeditions found plentiful populations of the valuable sea otter, and soon the fur trading companies developed small settlements. In the 1780s and 1790s, rivaling fur trading companies established settlements and forts in coastal Alaska on the Aleutian Islands, Kodiak Island, Kenai Inlet, Chugach Inlet, and Yakutat Bay. In 1799, the Russian Empire granted the Russian-American Company the sole right to hunt fur in Alaska. This action created a monopoly and gave the Russian-American Company a pseudo-governmental power over the landscape that was far removed from the center of imperial power in St. Petersburg. In 1808, the Russian-American Company moved their Alaskan headquarters from Kodiak Island to Novo-Arkhangel'sk (Sitka) on Baranov Island.

Russian colonization in Alaska was a commercial operation focused on extracting the wealth of fur resources. The Russian fur trading companies did not aspire to establish a domestic colony in Alaska. However, the czar required

the traders to support the Russian Orthodox Church, and the church sought a more permanent settlement through its missionary work. Thus, the imperial government, Russian Orthodox Church, and the fur trading companies held distinct roles in the Russian colonization efforts in North America. The fur trading companies drove colonization and reluctantly supported the Orthodox Church while operating with minimal oversight from the imperial government.

Provisioning the remote Alaskan colonies was one of the key concerns of the Russian-American Company. James Gibson, preeminent expert on Russian America, describes the significance of food to the Russian settlements as follows:

> *Of all of Russian America's weaknesses - insufficient personnel, uncertain supply, natural severity, Tlingit hostility, strong British and American competition, inadequate transport, depleting fur bearers - probably none was more critical than that of food supply.* (Gibson 1976, viii)

Russian employees of the fur trading companies favored their traditional domesticated food to the wild local foods in Alaska. However, shipping food to the colonies from Okhotsk and Kamchatka, Russia was extremely costly. Early on, the fur trading companies established gardens at the majority of the Russian settlements in Alaska to grow traditional Russian food plants. Individual employees also were allowed to cultivate personal gardens around their homes. The first recorded garden was established in 1784 in Three Saints Harbor on Kodiak Island. Russian settlers also established gardens on Kenai Inlet, Baranov Island, Unalaska Island, Atka Island, and at multiple locations on Kodiak Island, including St. Paul's Harbor.

While Kodiak, the Aleutian Islands, and Baranov Island have considerably warmer winters than interior Alaska, short growing seasons and cool summers greatly inhibited the development of agriculture in the Russian settlements. Grain grew poorly due to the wet summers and short growing seasons. Cold weather crops such as potatoes, turnips, rutabagas, carrots, radishes, beets, onions, and garlic were productive, while cabbage, lettuce, and cucumbers were

grown in small glass hot houses. Livestock did not thrive in the cold climate, but provided some respite from the plentiful supply of local fish. The Russian settlers raised cattle, pigs, sheep, goats, and chickens.

The majority of trappers employed by the fur trading companies came from Siberia. In Siberia, trappers collected furs in the winter months and were able to devote the summer months to vegetable gardening (Bolkovitinov 2001, n.p.). However, sea otter trapping primarily occurred in the spring and summer, and thus conflicted with the growing season. While some Russians participated in agriculture, it was a secondary activity to other company pursuits.

The Russian-American Company conscripted Aleut and Alutiiq Alaska Natives, expert hunters and sea navigators, to gather sea otters and other sea mammals in the Aleutian Islands and southwest Alaska. When the Russians moved their headquarters south to Novo-Arkhangel'sk, they brought these Alaska Native groups to hunt for sea otters and perform other labor. Native people were also employed in gardening and the Aleuts incorporated potatoes into their diet (Veltre 2011, 119).

Although their headquarters was located in southeast Alaska, the Russians had a more discordant relationship with the native people of this region. Despite this, the Haida and Tlingit learned to grow potatoes. They cultivated potatoes at villages as far as 330 miles away from Novo-Arkhangel'sk and transported their crops by canoe to the capital to sell to the Russian-American Company (Arndt and Pierce 2003, 153). In 1845, they sold 1060 barrels of potatoes to the colony (ibid, 153).

FORT ROSS

As the fur supply dwindled in Alaska from over hunting, the Russian-American Company sent expeditions southward along the western coast of North America. The Russian-American Company developed the Fort Ross settlement in northern California both to expand its fur enterprise and to provide food stuffs for the colony in Alaska. Fort Ross was Russia's southernmost settlement along the Pacific Coast (peripheral attempts of colonization were made in Hawaii in 1816).

Nikolai P. Rezanov, Russian-American Company Director, was the first to propose establishing a Russian settlement in California (Gibson 2013, 189). In 1806, Rezanov visited several Spanish missions in Alta California. He was the first Russian traveler to write about the orchards at the California missions: he described the figs, peaches and quince at the San Francisco mission; the grapes at San Jose and Santa Clara missions; and the oranges at Santa Barbara (Istomin, Gibson, and Tishkov 2005, 153). The potential for fruit production in Alta California impressed Rezanov who had recently traveled through Alaska and noted the scarcity of food supplies and the lack of ethnic Russian food products at the settlements there.

The agricultural systems at the missions far surpassed the attempts at agricultural production in Alaska. California's distinctively longer growing season and warmer climate was more suitable to growing substantial amounts of fruit, vegetables, and grains. Rezanov saw a potential solution to Alaska's food supply problem. After returning from California to Sitka, the Russian-American Company correspondent wrote a set of secret instructions to Chief Manager Alexander A. Baranov with recommendations for the colony. In these instructions, Rezanov elaborates on the dearth of agricultural supplies available in Alaska, stating, "A lack of grain supply is making the people more prone to illnesses, hunger and death itself" (Rezanov 1806, n.p.). He then puts forward six options to acquire food supplies for the settlements in Alaska. He proposes establishing trade with Spanish California, Japan, the Philippines, the Bostonians (United States), or China, or establishing a

colony in northern California to grow food for the Alaska settlements. He describes the California option as follows:

> *The fourth option, I consider to be the most fail-safe, is the shore of New Albion*[3] *, that I don't leave off from drawing all possible of the administration's attention to, in order to initiate an installation of our dispatched there and establish a post to take advantage of the innumerable local Indian inhabitants and practice agriculture. [Agriculture in New Albion] will be bestowed with an abundance of success due to the benevolence of the land, that is on par with [Spanish] California.* (Rezanov 1806, n.p.)

This document provides evidence that agriculture was a key consideration in establishing the Fort Ross Colony. It was already apparent that California was an exceptionally productive land and, despite the risks, the opportunity to take advantage of this landscape beckoned.

In 1808, two years after receiving Rezanov's recommendations, Baranov sent reconnaissance missions to Alta California to hunt for sea mammals and investigate suitable locations for a settlement. An expedition led by Ivan Kuskov surveyed the Fort Ross site in 1811. The location, north of all Spanish settlements, was chosen based on the availability of water, an accessible beach, flat land, and, perhaps most of all, defensibility. The Russian-American Company founded the settlement in 1812. The fort was built on Kashaya Pomo land and several village sites were located near the settlement. In 1817, the Russians made an official agreement with the Pomo for the use of the land in exchange for some minimal trade goods.

Ivan Aleksandrovich Kuskov was the first manager at Fort Ross and he stayed until 1821. He was followed by Karl Ivanovich Schmidt (1821 to1824), Pavel Ivanovich Shelikhov (1825 to 1830), Peter Stepanovich Kostromitinov (1830 to 1838), and finally Alexander Gavrilovich Rotchev (1838 to 1841). The primary Fort Ross development consisted of housing for the Russian-American Company

3 The Pacific Coast from the Columbia River to the San Francisco Bay. The name New Albion was bestowed on the northern California area by Sir Francis Drake in 1579. The Russians continued to use the title in order to negate the Spanish claim to northern California.

Figure 2.3: *French Captain Auguste Bernard Duhaut-Cilly's drawing of Fort Ross, 1828 (Fort Ross Conservancy Library).*

upper management, a chapel, store, and food storage building surrounded by a stockade. Outside the central fort, the Alaska and California Native American employees established village sites and Russian and Creole employees built small houses with gardens. The fort settlement soon included barns, two threshing floor, two windmills, a tannery, forge, and ship building yard.

RUSSIAN AGRICULTURE IN CALIFORNIA

Agriculture at Fort Ross consisted of raising livestock and growing grain (primarily wheat and barley), vegetables, and fruit. Agricultural activities expanded rapidly and eventually cultivated areas extended up to two miles from the fort (Gibson 1976, 116). As was practiced in Alaska, in addition to official Russian-American Company gardens, individuals developed small vegetable gardens around their homes. By 1817, over fifty vegetable gardens had been cultivated around the fort (Fedorova 1973, 359). As the colony progressed and the sea otter population continued to decline, agriculture became more central to the purpose of the colony.

Despite the promise of agriculture in California, the foggy coastal climate of northern California did not support productive grain cultivation. The Russian-American Company attempted to cultivate land in several other locations less influenced by the fog. Ranchos were

established near Bodega Corners (Khlebnikov Rancho), on lower Willow Creek (Kostromitinov Rancho), and near Purrington Creek (Chernykh Rancho) (Gibson 1976, 117-118). The Kostromitinov Rancho reached 98 to 100 acres of cultivated land and the Chernykh Rancho had over 200 acres in cultivation.

The descriptions of agriculture at Fort Ross vary. Some visitors saw the farms as productive and well ordered, while others saw them as unorganized and failing. In 1824, Otto von Kotzebue visited the fort and described the agriculture at the settlement:

> *Some wrests [sic- versta- 1.06 kilometers] farther inland, beyond the injurious influence of the fog, plants of the warmest climates prosper surprisingly. Cucumbers of fifty pounds weight, gourds of sixty-five, and other fruits in proportion, are produced in them. Potatoes yield a hundred or two hundred fold, and, as they will produce two crops in a year, are an effectual security against famine. The fortress is surrounded by wheat and barley fields, which, on account of the fogs, are less productive than those of Santa Clara, but which still supply sufficient corn for the inhabitants of Ross.* (Kotzebue 1967, n.p.)

While Kotzebue describes the negative influence of the fog on grain production, he appreciates the substantial potato crop and the high productivity of the vegetable gardens up the hill from the fort.

In 1820, Kirill Khlebnikov described the agriculture in more detail. He echoes Kotzebue's assessment of mixed results:

> *Mint has also grown exceptionally well. Various kinds of beans and peas have been planted and are flourishing. The potatoes planted in March have been harvested, and those planted in May are due in the fall. The melon, pumpkin, and watermelon crops for this year promise to be good, whereas last year they were damaged because there was so much fog. Two years ago, 800 watermelons were harvested. A rather large quantity of Ukrainian and Virginia tobacco varieties has been planted in the lower plots, and last year's crop yielded 20 puds [one pud equals 36.11 pounds]. The wheat is maturing, and*

> *is flourishing at one spot higher up, thanks to the black earth; but the wheat planted in February on a northern slope is mediocre because of the sandy soil, and the same applies for the crop planted in November following the example of the Spaniards.* (Khlebnikov 1990, 56-57)

Khlebnikov's account indicates that the Russians experimented to find the best locations to cultivate plants. He also verifies that some of the agricultural practices at Fort Ross were based on observations at the Spanish missions, which, as described earlier, he and other travelers had visited.

Vasilii Golovnin, a Russian sea captain who visited Fort Ross in 1818, described the agriculture as follows:

> *The land here produces many crops in abundance. At present, under Mr. Kuskov's direction, the gardens grow cabbage, lettuce, pumpkins, horseradish, carrots, turnips, beets, onions, and potatoes. Even watermelons, cantaloupes, and grapes, which he has not grown for long, ripen in the open air. Very tasty garden vegetables sometimes reach extreme size: for example, one horseradish weighed about 45 lbs. ...and they often grow to about 35 lbs. Pumpkins here are sometimes 50 lbs., and one turnip weighted 15 lbs. Potatoes are especially prolific: at Ross their usual fertility is one hundred from a single apple [potato seed], and at Port Count Rumyantsev 180 and 200 [potatoes] sometimes grow from a single apple, and besides, they plant them twice a year. Those sown in early February are harvested in late May, and whatever is sown in June is ready in October. Mr. Kuskov has experimented a little with agriculture, but due to a lack of necessary tools and enough workers, and perhaps inexperience too, the harvests have not corresponded to expectations, for this very year the wheat crop gave him only four times the seed, and barley five times.*
>
> *He also raises cattle and is successful beyond doubt, for the abundant pastures, ponds, and year-round fresh fodder permit a small number of people to manage large herds. He now has ten horses, 80 head of cattle, 200 sheep, and over 50 pigs. These animals are all in fine condition.*

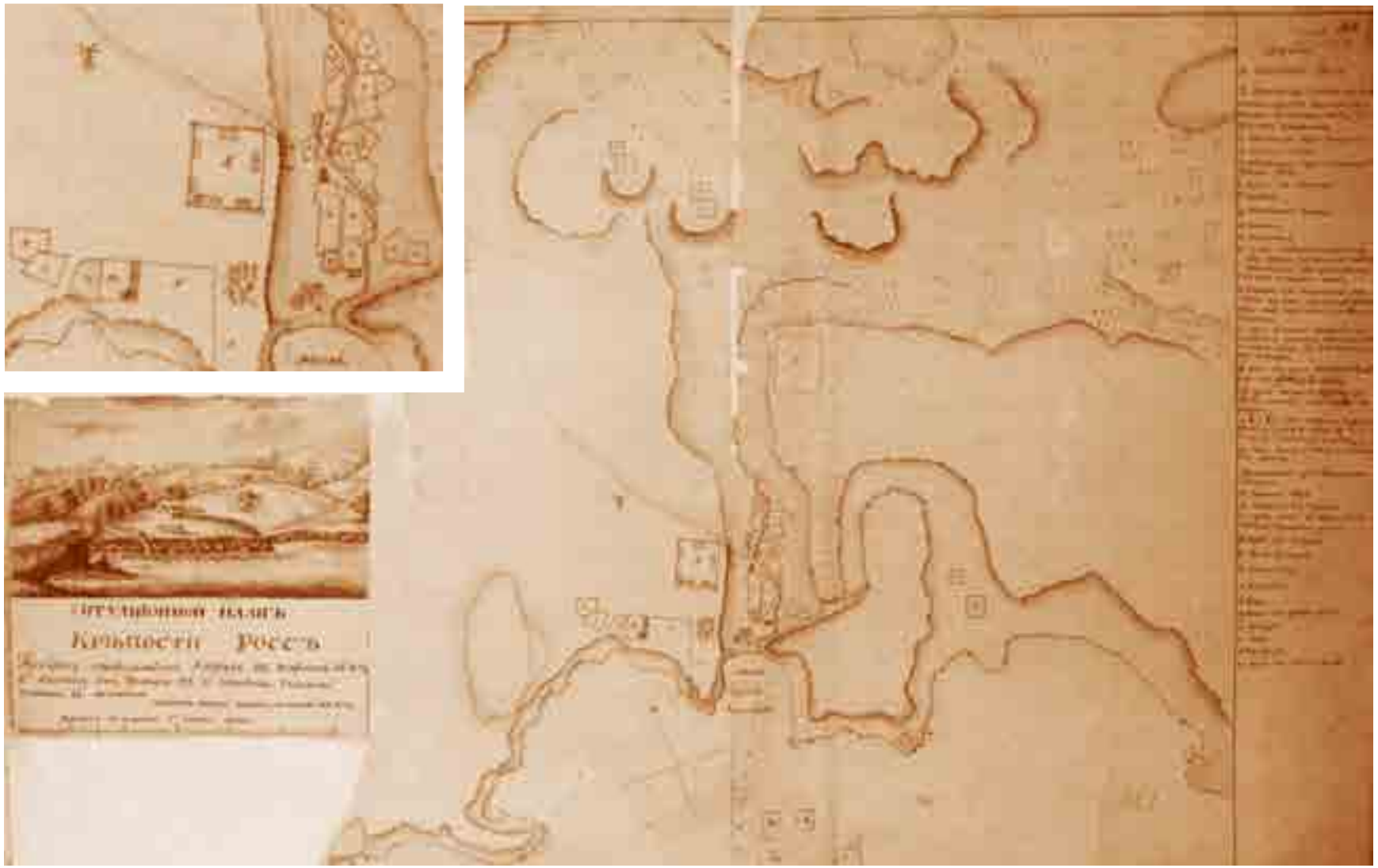
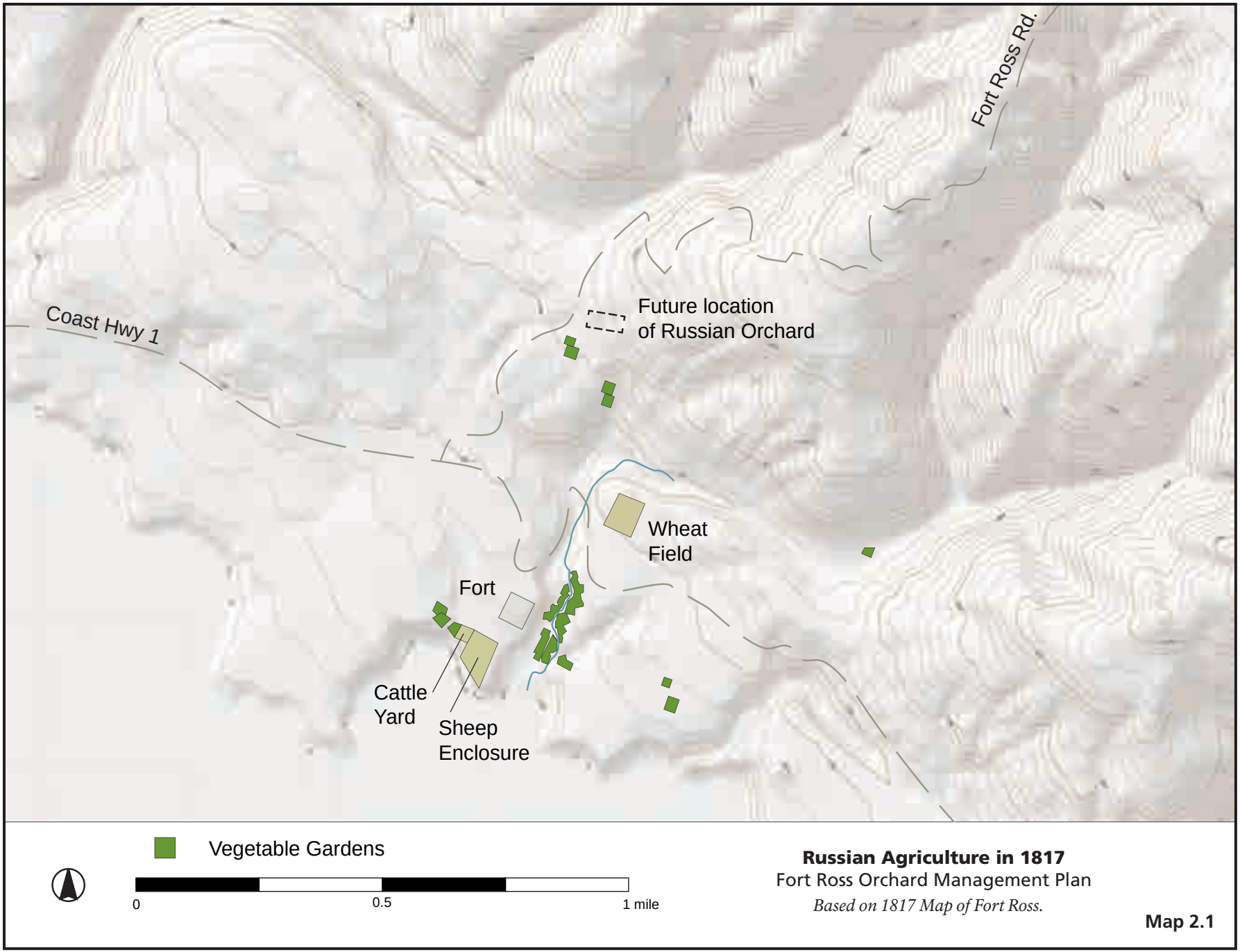


Figure 2.4: *Map of Fort Ross, 1817. The orchard is not depicted on the map and would have been located in the open area above the four square vegetable gardens at the top center of the map. Several vegetable gardens are drawn on the map and the key indicates that fifty vegetable gardens were located around the fort (Fort Ross Conservancy Library). (detail top left)*



Russian Agriculture in 1817
Fort Ross Orchard Management Plan
Based on 1817 Map of Fort Ross.

Map 2.1

> *From the two steers he gave me, the meat alone weighed 1800 lbs. [47 pood]. He has lots of poultry, such as geese and chickens.* (Golovnin 1965, 178-179)

Golovnin also indicates that Kuskov directed agricultural experimentation at Fort Ross. While he describes the vegetable crops as abundant, he again points out that the grain crops did not reach their expected yield.

For the most part, the Russian colonists at Fort Ross had little experience in farming. Cattle ranching proved to be the novice farmers' most successful agricultural endeavor. The colony produced butter and meat that they shipped to Alaska. The grain crops, however, were never as successful as the Russians had hoped. The grain grown at Fort Ross only supplemented the overall supply for Alaska and the Russians continued to purchase grain from the Spanish, Mexicans, and Americans. Vegetable and fruit production were secondary to the agricultural operations at Fort Ross and also did not provide a significant source of food for Alaska. In his summary of his visit to the colony in 1833, Baron von Wrangell wrote, "I do not mention gardening and orcharding at Ross because neither one nor the other brings the Company profits and should remain pursuits of private persons only" (Farris 2012, 160). The agricultural experiments conducted at Fort Ross were largely unsuccessful.

LABOR

Russian employees, Alaska Natives, and California Native American people all participated in farming and ranching activities at Fort Ross. The Russians referred to all the Alaska Natives at Fort Ross as Aleuts, but Alutiiq (Sugpiaq) people from Kodiak Island and Dena'ina Athabascan people from Cook Inlet worked at the settlement. Kashaya Pomo, Southern Pomo, and Coast Miwok California Native American people performed both year round and seasonal labor.

The Spanish set the precedent for the forced servitude of the California Native American people. California Native American people were captured, baptized and forced into

servitude at the Alta California missions. Mariano Vallejo, a military commander and director of northern colonization, called the treatment practices of the California Native American people "monstrosities." In 1833, he wrote, "It would not be difficult for me to give Your Honor some examples of some of the methods actually practiced at the missions in this area, such acts that would horrify the most feral of men" (Vallejo 2000, 9). Originally the Russians seemed to use more humane labor practices and criticized the mission labor policies. They paid the Kashaya Pomo, Southern Pomo, and Coast Miwok people to work at the settlement and especially to help with grain harvest. Eventually, however, the labor practices at Fort Ross became more similar to those at the missions. The Russian-American Company captured California Native American people and forced them to work during the harvest. After visiting Fort Ross, Governor Ferdinand Wrangell, the highest ranking Russian-American Company employee in America, wrote that the labor practices were inhumane and advocated for increased wages and rations to native workers (Gibson 1969, 211).

While the Franciscans who ran the missions had experience in agriculture before arriving in Alta California, the Russian-American Company employees lacked the knowledge needed to establish a successful agricultural colony. Some of the California Native people who had worked at the missions and had knowledge of the mission agricultural practices including "planting, harvesting, and threshing" were employed at Fort Ross (Farris 2012, 175). These skills were likely valuable to the Russians. In 1834, Wrangell criticized the Russian employees stating, "*The agriculturalist here have scarcely any conception of how to cultivate fields. Like promyshlenniks [Russian contract workers] in general who have come to America, they are made up of all kinds of riff-raff. Even the managers who administer agricultural affairs here have had no experience whatsoever in these matters*" (Wrangell 1834, 3).

Khlebnikov, for his part, sought to remedy the situation by requesting that experienced farmers be sent to Fort Ross. He wrote:

> *For tilling the soil, several experienced and hardworking families are needed who know their trade, because when hunters who have never done any farming and only know how to hunt and fish are detailed for a time to do work that they are no longer accustomed to, they cannot possibly satisfy the economic requirements to the fullest.* (Khlebnikov 1990, 57)

Families of experienced agricultural workers were never brought to Fort Ross. However, in 1836, an experienced agronomist educated at Moscow Agricultural School, Egor Chernykh, was sent to improve the agricultural practices. Chernykh provided guidance on grain cultivation and harvesting and worked to expand the inland farms that were not influenced by the negative effects of fog. His arrival, however, was at the final stage of the development of Fort Ross and he was unable to remedy the problems associated with the climate, pests, and labor shortages.

ORCHARD OVERVIEW

Although the climate of the Russian-American Company headquarters in Novo-Arkhangel'sk in southeast Alaska could have supported small-scale fruit production, there is no evidence to indicate that the Russian-American Company planted fruit trees in Alaska. The Russians who established Fort Ross were likely excited about the greater opportunities California provided in terms of agriculture overall and fruit production specifically. As mentioned earlier, the first Russian trees were planted in 1814, two years after the founding of Fort Ross. Fruit trees were eventually grown at two orchards in the foothills behind Fort Ross and at the Chernykh Rancho. The orchards at Fort Ross contained apple, peach, pear, Bergamot pear, cherry, and quince trees and grape vines. The Chernykh Orchard contained pear, cherry, and plum trees and grape vines. By 1841, the last full year the Russians spent at Fort Ross, the two Russian Orchards contained 280 fruit trees.

Importation of Fruit Trees and Grape Vines

While the Russians brought vegetable seeds to Alaska and to Fort Ross from Russia, there is no evidence that any of

Table 2.2: Early Fruit Tree Planting and Harvest at Fort Ross *(Khlebnikov 1976 and 1990)*

Date Planted	Fruit	Propagule	Location	Date Harvested
1814	peach	plant	San Francisco	1820
1817	grape	vine	Lima, Peru	1823
1818	peach, apple	seed	Monterey	c. 1828
1820	apple, pear, peach, cherry, Bergamot pear	plant (from cutting)	Santa Cruz	1828

the fruit trees grown at Fort Ross had a Russian origin. Rather, plants, cuttings, and seeds were obtained from the Spanish missions in Alta California and from other ports of call of the ships that visited Fort Ross. Kirill Khlebnikov's reports provide the most detailed provenance to the fruit trees grown during the Russian period at Fort Ross. He states that Christopher Benzeman brought peach trees to Fort Ross from San Francisco in 1814 on the schooner Chirikov (Khlebnikov 1976, 121). Later, in 1817, a ship captained by Leontii Hagemeister brought grape vines from Lima, Peru (Khlebnikov 1990, 56). These grapes were likely the first planted in what would become Sonoma County. In 1818, peach and apple seed were brought from Monterey (Khlebnikov 1990, 56), and in 1820, one hundred small cuttings of apples, pears, cherries, peaches and Bergamot pear were brought on the vessel Buldakov from Santa Cruz (Khlebnikov 1976, 121).

Letters directly from Hagemeister provide additional evidence related to Khlebnikov's accounts. In 1818, Hagemeister wrote to Lieutenant Ianovskii stating:

> *I tried to obtain more grape vines, but unsuccessfully, so you will have to try to raise grapes for the company from the ones I brought from Peru…Seeds from the enclosed pears and apples will perhaps be of use and will provide yet another reason for people to remember you with gratitude. Plant them like peaches, for in such manner they grow fruit trees throughout /Spanish/ California without grafting.* (Hagemeister 1818, n.p.)

Hagemeister indicates that he sent seeds of both pears and apples to the fort. His account also documents the use of seeds for the propagation of fruit trees at the missions.

The fruit trees and grape vines established themselves quickly at Fort Ross. In July of 1820 Khlebnikov described the development of the orchard:

> *On the slopes I saw two grapevines growing from those we had brought from Lima on the Kutuzov in 1817. There is a good chance that one of them will yield grapes this year. The peach tree, which I mentioned in my notes in 1817, is now bearing its first fruit. Captain Leontii Andreianovich Hagemeister had brought fresh seed from Monterey in 1817, from which two small apple and fourteen peach trees had grown, the former three and the latter seven feet high. The rose branches brought from San Francisco in 1817 have produced a beautiful bush and embellish the garden.* (Khlebnikov 1990, 56)

Thus the peach tree, brought from San Francisco, was bearing fruit in 1820. The propagation of fruit trees from seed also seemed to be successful and the seedling trees were growing rapidly. The fruit of the trees planted in 1820 were harvested in 1828. The grapes became productive in 1823.

Khlebnikov reported providing an abundance of live plant materials to Fort Ross to greatly expand the orchard. He wrote:

> *We delivered at the fort two boxes of fruit trees from Santa Cruz. Mr. Kuskov placed them in his garden and informed me that he had counted 100 plants, but that some of them had died. There were various kinds of apple trees, pear trees, bergamots, peach trees, and cherry trees.*[4] *I also delivered seed for peach trees, watermelon, and cherry trees, which were thriving well at Fort Ross.* (Khlebnikov 1990, 87)

Based on these descriptions, seeds, cuttings, and trees were all brought to Fort Ross and successfully grown. Seeds planted by the Russians would have produced fruit trees of no specific variety. The vegetatively propagated trees (from Santa Cruz) and the grape cuttings (from Peru) could have represented specific varieties. Listan Prieto and Muscat

4 Bergamot refers to the Bergamot-type round pear rather than Bergamot orange.

of Alexandria grapes were grown by Spanish Missions in South America and Peru and several varieties of pear were documented in Spanish California including *Presidenta*, *Pana*, *Lechera*, *Pera de San Juan*, and *Bueno Cristiano*.

There is no record of the introduction of new plant material for propagation to the settlement after 1820. However, by the early 1830s, the orchard contained many more trees than had been documented by Khlebnikov. In 1833 Mariano Vallejo, *Comandante* of the Presidio of San Francisco, wrote that the orchard "located on the best land at the bottom of an embankment that is part of the hills above Ross" contained 400 fruit trees and 700 grape vines (Vallejo 2000, 12). Although these numbers may have been an exaggeration as the inventories at the time of sale eight years later cited only 280 fruit trees, they indicate that the orchard was flourishing and highly productive and that additional undocumented plant material was likely obtained from the missions in the 1820s and early 1830s.

The most detailed description of the orchard at Fort Ross was written at the end of the Russian Era. By 1841, the Russians had decided to leave Fort Ross and sought a purchaser for their land and supplies. Prior to the sale, an inventory of the property was prepared that included an inventory of the orchard. Three versions of the inventory exist (Mariano Vallejo 1841, John Sutter 1841, and Duflot de Mofras 1842). The versions, for the most part, are replicates, but contain some significant discrepancies (Farris 2012, 286). The Vallejo description is provided below as it contains slightly more detailed information in relation to the orchard:

> *Fruit Orchard: 55 brazas*[5] *[385 feet] long; 24 brazas [168 feet] wide: surrounded by a wooden fence [the Sutter inventory calls this a post fence and the de Mofras inventory a wooden palisade]. It has more than 260 fruit trees:*
>
> *207 apple trees*
>
> *29 peach trees [strictly, clingstone peach]*

5 Whereas a "braza" is equal to 5.5 feet the term was translated directly from the Russian "fathom" which is 7 English feet in length. The translations to feet reflect this discrepancy (Farris 1983).

10 pear trees

10 quince trees

8 cherry trees

also some vines.

The orchard has a new house with four rooms, length 4 ½ brazas [31.5 feet], width 4 brazas [28 feet], roofed with planks, here a kitchen 2 ½ brazas [17.5 feet] square.

Nearby is a small orchard, 14 brazas [98 feet] long, 10 ½ brazas [73.5 feet] wide; said orchard had more than 20 fruit trees and also some vines. (Farris n.d.)

In summary, according to the Vallejo inventory, the orchard was 385 feet by 168 feet. The house, also mentioned by Laplace, was located within or directly adjacent to the orchard and was 31.5 feet by 28 feet with an additional 17.5 foot square kitchen. The orchard house could have been a dacha or secondary garden house built for the Fort Ross manager with a large separate kitchen. A second nearby orchard was 98 feet by 73.5 feet. The larger orchard contained 260 fruit trees, while the smaller orchard contained only 20 fruit trees. Grape vines grew in both orchards. The inventory did not define the arrangement of the trees or the overall condition of the orchard.

Orchard Maintenance

There is little evidence related to who maintained the fruit trees in the Russian Era. According to Khlebnikov, Fort Ross Manager Kuskov planted fruit trees in the orchard. Thus, the orchard was a concern of the highest ranking official at Fort Ross. In 1822, Khlebnikov wrote, "*Mr. Schmidt says that there is nobody to take care of the garden [orchard], because Mr. Kuskov had sent home the sole Aleut who used to look after it. I advised Mr. Schmidt to attend to the garden himself, at least enough so that it does not fall into a state of complete neglect*" (Khlebnikov 1990, 102). Thus, prior to 1822 an Alaska Native of Aleut, Alutiiq, or Dena'ina decent maintained the orchard. After this man left, it is undocumented whether Karl Von Schmidt, Fort Ross Manager from 1821-1824, took Khlebnikov's advice and looked after the orchard

himself. Toward the end of the Russian period a house was built in the orchard that was utilized by the manager Peter Kostromitinov. While Kostromitinov demonstrated considerable interest in the orchard by building a house there, it is unclear if he supervised the maintenance of the orchard. As with other agricultural activity at Fort Ross fruit production was experimental and the maintenance of the orchard was likely limited and inconsistent.

By 1841, it has become clear that the agricultural activities at Fort Ross were not a cost effective pursuit. The Russian-American Company could purchase food supplies from the Americans, British, or Mexicans for cheaper than they could produce food at Fort Ross. The Russians found an interested buyer in John Sutter, the German immigrant who founded the New Helvetia settlement. The Russians sold the buildings, supplies, and animals at Fort Ross to Sutter and returned to Alaska, where they would remain in power until 1867.

CHARACTER OF THE ORCHARD IN THE RUSSIAN ERA

Establishing the physical character of the orchard is essential to the process of historic preservation as it serves as a baseline for any treatment measures. The physical character of the orchard pertains not only to the plant varieties but also to their spatial arrangement within the surrounding environment. The character of a historic garden can be established through photographs, drawing, maps, and written accounts from the era. In the case of the orchard at Fort Ross, only written descriptions are available. Photography was in its infancy in this period and Russian Era illustrations focus primarily on the vicinity of the fort.

The only Russian Era map of Fort Ross was created in 1817, just three years after the first fruit tree was planted. The map, while extending behind the fort to include vegetable gardens and grain fields, does not include a notation of the location of the orchard. Thus, historic descriptions of the orchard at Fort Ross offer the only insight into the layout, composition, and character of the orchard. The descriptions illustrate how the orchard changed from 1814, when the first tree was planted, until 1842, just after the Russian-American

Company left Fort Ross. Although the accounts are the only glimpse at the character of the orchard, they are sometimes contradictory and may have been influenced by the perception of the visitor. Taken together, the descriptions provide significant information about the orchard while at the same time evoking many questions that may not have an answer within the historic record.

The first description of the physical character of the orchard was written by Khlebnikov in October of 1822, when the garden was just eight years old. He expresses a sense of accomplishment upon seeing the growth within the orchard that he had helped to plant:

> *We finally arrived at the garden, and I was very pleased by what I saw, because I had helped with the planting of the fruit trees there. The big peach tree that Mr. Benseman[sic] had brought in 1814 is covered with fruit, but only a few are ripe. The trees brought by Mr. Hagemeister in 1818*

Figure 2.5: *Row of Capulin cherry trees planted by the Russian-American Company, c. 1940 (Fort Ross Conservancy Library).*

> *have yielded an abundance of fruit. The various fruit saplings brought in 1820 on the Buldakov, more than 100, are all flourishing and some of them have grown five or six feet. Unfortunately, they were all planted in one line next to the fence in a disorderly fashion, and eventually they will become unsightly. If only they had been planted with some degree of care, they would not only yield fruit but would also be pleasant to behold.* (Khlebnikov 1990, 102)

Khlebnikov points out that the trees brought on the Buldakov (apple, pear, peach, cherry, and Bergamot pear) were planted in a "disorderly" row. He also acknowledges that the peach tree had grown significantly and that overall the garden was highly productive.

Three years later, in 1825, Khlebnikov contradicts his 1822 report and states, "The orchard is well-arranged: grapes, peaches, apples, and pears are cultivated" (Istomin, Gibson, and Tishkov 2005, 640). While in 1822 Khlebnikov described the orchard as disorderly, by 1825 he considered it properly arranged. In November of the same year (1825), the newly appointed manager of Fort Ross P.I. Shelikhov described the orchard in his summary of the activities of the colony:

> *Gardening has also been organized. The garden plot has been expanded and enclosed by a sturdy wooden fence. Fruit tree have been planted in the correct manner; a trial has been made with the cultivation of grapes, and it seems that there is hope of growing a lot of them.* (Istomin and Gibson 2014, 62)

Shelikhov corroborates Khlebnikov's 1825 account indicating that the orchard trees were purposefully arranged. Shelikhov also provides the first documentation that the fence surrounded the orchard. The change in the orchard condition from 1822 to 1825 could have resulted from tree growth, limited tree survival, or orchard expansion.

While the Khlebnikov and Shelikhov descriptions from the same year correspond to each other, the next description of the orchard, written fourteen years later in 1839, provides an alternate view of the orchard and its surroundings. This description was written by Cyrille Pierre-Théodore Laplace,

captain of the French ship Artémise, who visited Fort Ross in August of that year. Laplace's illustrative description focuses more on the forest surrounding the orchard than the orchard itself:

> *From time to time the strong heat of the sun chased us from the interior of the fort. This was on days when the breeze that usually cooled things failed to come. At such times we went to dine at a cottage situated in the wood near our residence, in the middle of a clearing surrounded on all sides by magnificent conifers. In the shade of these ancient masters of the land, reigned a sweet obscurity and a delicious freshness, even during the worst heat of the day. The ground was not like the intertropical forests, covered with thick shrubs or parasitic plants that form such an impenetrable obstacle that only the Indian hunter and wild animals can enter. Rather it was like a well-kept park. We walked on veritable lawns of turf and our gaze penetrated deeply under the vaults of foliage. Around the house extended a kitchen garden where the preceding governor [Kostromitinov- commandant of Fort Ross 1830-1838] had planted some of our European fruit trees and vegetables. Neither had prospered whether it was for lack of care or the soil of the forest. The fruits were small and badly formed and the exotic plants seemed to survive only with difficulty against the native plants that attempted to extinguish them.* (Farris 2012, 249-250)

Laplace's account although especially detailed, could be a bit fanciful. He provides the first reference to the house built adjacent to or within the orchard. As mentioned earlier, this house was documented in the 1841 site inventory. Laplace implies that the house within the orchard belonged to Kostromitinov and thus emphasizes that the highest ranking Russians used the orchard as a retreat from the crowded fort. Laplace also expresses that the garden was not only an orchard but also contained vegetable beds.

The next description of the orchard was written after the Russians sold Fort Ross to John Sutter, John Bidwell, Sutter's business manager, visited Fort Ross. While the buildings were already suffering from neglect, Bidwell found the orchard in good condition:

> *All concur in pronouncing the country good for fruit; apples &c. I presume it is so; I went to Ross (this is the most Northern settlement in California) on the 25th of January [1842] - I saw here a small but thrifty orchard consisting of Apple, Peach, Pear, Cherry, and Quince trees- the Peach trees had not shed their leaves and several were in blossom, the Quince and more than half the apple trees were as green as summer. There were roses, marygolds [sic] and several kinds of flowers in full bloom…* (Bidwell 1842, 50)

Later that year Bidwell documented a fire at Fort Ross that burnt two small houses (possibly the orchard house), the grass in the orchard, and some of the orchard fence. Bidwell's account offers a vision of the area that would continue to define the early Ranch Era: over the years, the buildings of the fort fell into further disrepair and many were dismantled. However, the orchard trees at Fort Ross continued to grow and reach maturity.

RANCH ERA

The end of the Russian Era and the beginning of the Ranch Era at Fort Ross were congruent with a tumultuous period

Figure 2.6: *View of the fort and ranch, 1877. The potato barn built by Benitz is at left. The second and old growth redwood forest grows between the fort and grazing pasture (Fort Ross Conservancy Library).*

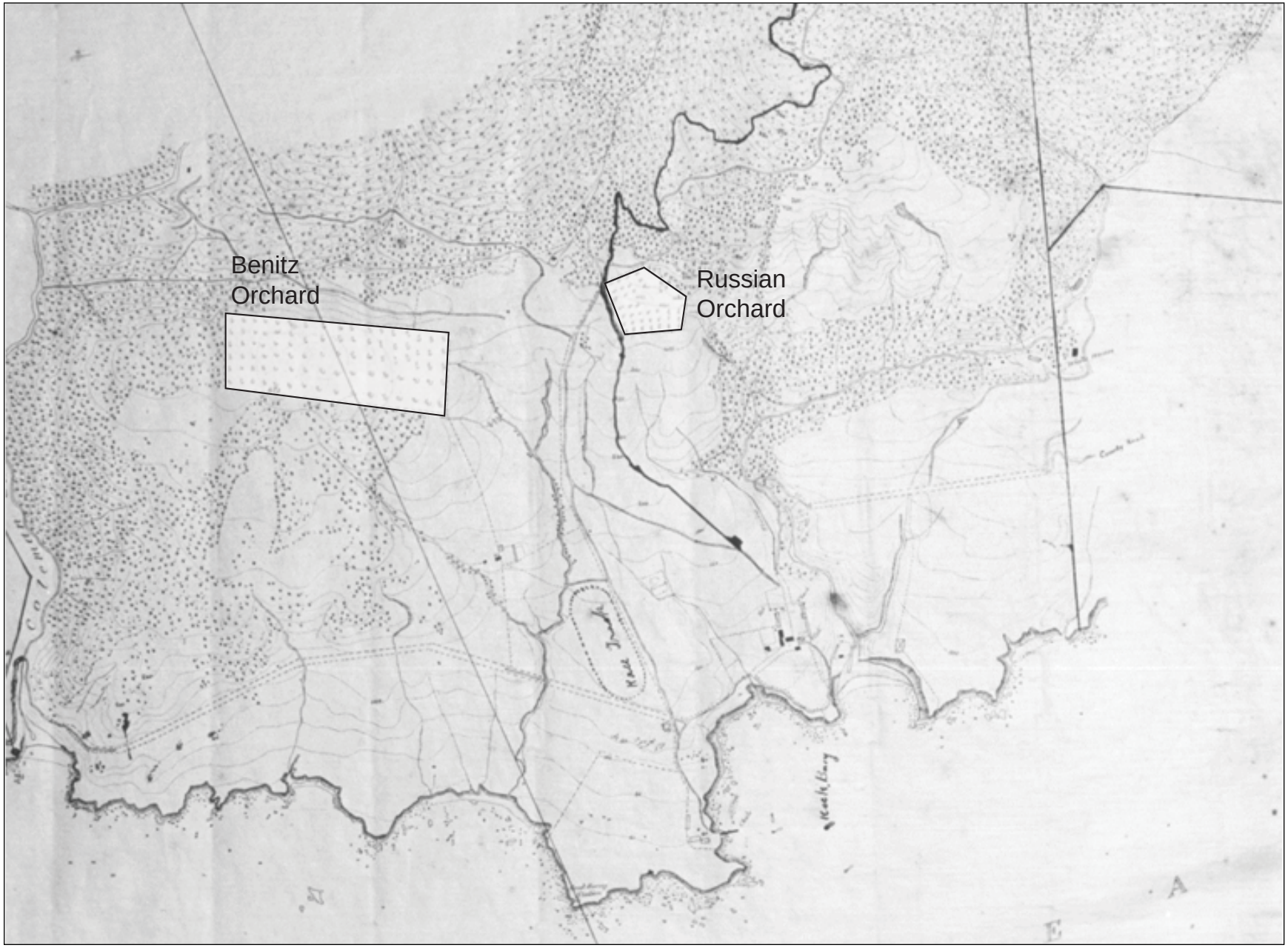
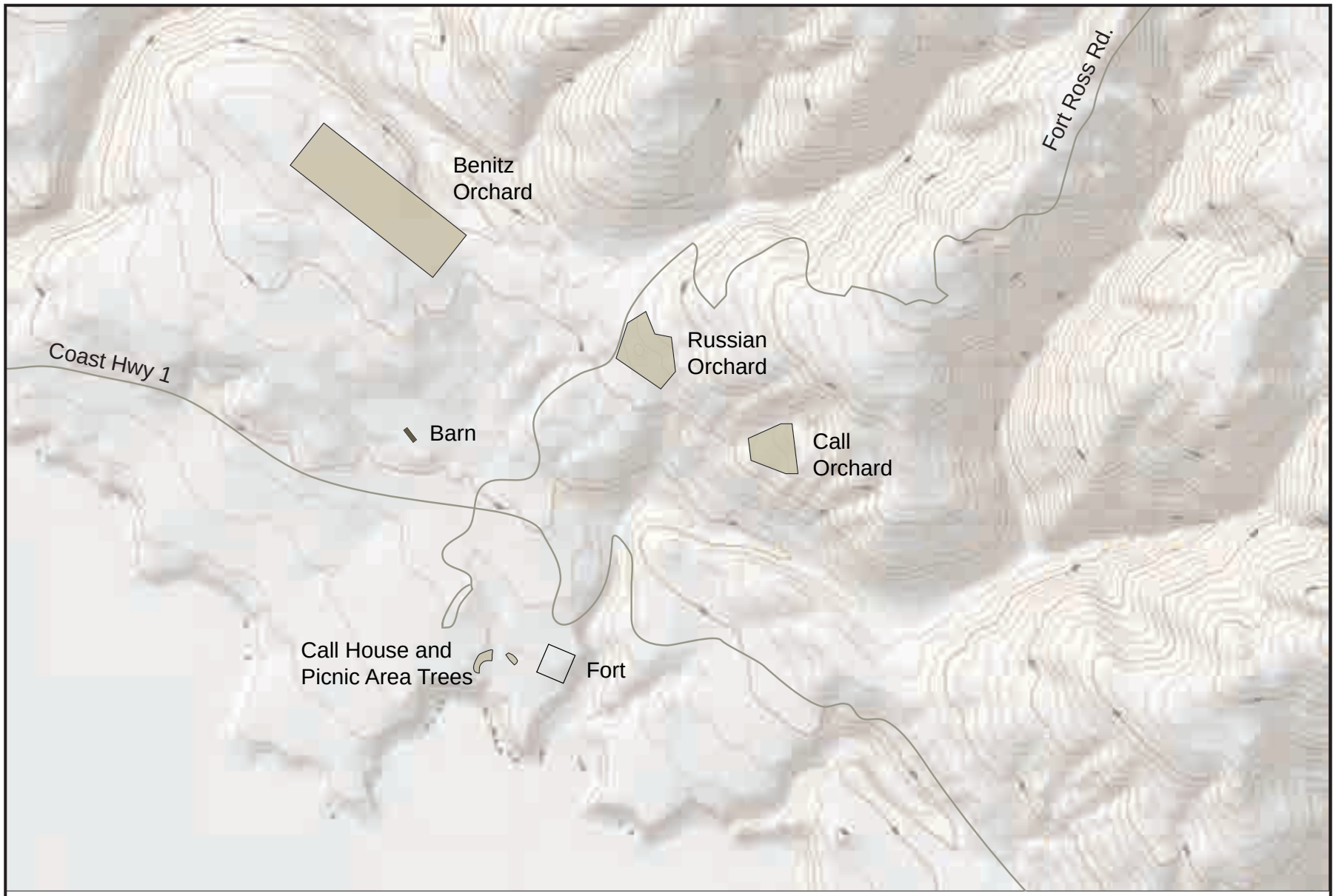


Figure 2.7: *Survey depicting the Russian and Benitz Orchards, 1876 (Fort Ross Conservancy Library).*



Ranch Era Orchards and Fruit Trees
Fort Ross Orchard Management Plan
Based on 1876 survey of Fort Ross.

Map 2.2

in the history of California. Both the 1820s and 1830s were marked by significant changes in California's principal establishments. The Mexican government, expanding on the practice of the Spanish, promoted settlement in California by offering large land grants to settlers. In 1848, the Mexican governance of California was terminated by the Treaty of Guadalupe Hidalgo, which ceded the territory over to the United States. By this time the Mexican government had authorized over 500 land grants, covering approximately one-sixth of California (Adams 1946, 24).

The same year that California became a territory of the United States, gold was discovered on John Sutter's land on the South Fork of the American River. The following year thousands of "49ers" traveled west to search for gold. The influx of prospectors advanced agriculture within the state: the prospectors provided a large market for agricultural products and resourceful immigrants planted fruit orchards on their farms to fill the demand.

The Ranch Era at the Fort Ross Orchard began under Mexican governance when Sutter acquired the property from the Russian-American Company in 1842 and concluded in 1976 when the property containing the orchard was sold to the State of California to be included in Fort Ross State Historic Park. The Ranch period is punctuated by four phases of ownership:

Sutter	1841 - 1843
Benitz	1843 - 1867
Fairfax and Dixon	1867 - 1873
Call	1873 - 1976[6]

During both the Sutter period and the Fairfax and Dixon period, little attention was paid to fruit production at the Fort Ross orchards. Sutter's ownership was short-lived. He largely purchased the property for the equipment and building materials, which he shipped to his settlement at New Helvetia (Sacramento). Fairfax and Dixon also had a brief period of ownership during which time they focused

6 The Calls resided on the property from 1874 until 1970.

primarily on lumber harvest. Cattle ranching and dairy farming were respectively the most prominent agricultural activities during the Benitz and Call periods. However, both families planted fruit trees at Fort Ross and harvested the fruit to sell. The Benitz and Call families continued the tradition of fruit production at Fort Ross.

Benitz Family

Among the immigrants advancing agriculture in the Mexican and early American period in California was the family of William Benitz. William Benitz was the last of a series of managers who came to Fort Ross under Sutter's ownership. Benitz was born Wilhelm Böniz in Germany in 1815. He immigrated to Mexico in 1832 and arrived in California ten years later.

Benitz came to Fort Ross in 1843. By 1845, he sought to purchase the land. Complications arose when the Mexican government granted a large parcel of land stretching from the Russian River to Timber Cove to Manuel Torres as *Rancho de Muniz*. Thus, both Sutter and Torres had claim to Fort Ross. After several years of litigation, Benitz and his partner Charles Meyer were forced to pay both Torres and Sutter to acquire the title to the property.

Figure 2.8: *Josephine Benitz, Benitz children, and nurse, c. 1866 (courtesy of the Benitz Family).*

After moving to Fort Ross, Benitz met and married Josephine Kolmer. Josephine was also a German immigrant. Her family had come to St. Louis from Baden when she was a young child. In 1845, her family traveled west on a wagon train via Sutter's settlement, New Helvetia, California. Josephine and William had ten children at Fort Ross, although the first three died as infants.

The Benitz family followed in the Russians' footsteps, tilling the fields above Fort Ross and raising cattle on the hills that rose up from the coast. Benitz grew barley, oats, wheat, potatoes, and vegetables, and harvested the fruit from the Russian trees. He also built a large potato barn to the east of the fort compound. In addition to cattle, Benitz raised horses and sheep. The cattle and horse operations were the most profitable. Following the common practice of the day, Benitz likely used some of the fruit from the Russian Orchard for cattle and horse feed.

Benitz's letters to his brothers in Pennsylvania and Germany provide substantial information about the activities at Fort Ross during the early Ranch Era. In 1856, Benitz wrote to inform his brother of his progress in California. By that time he had 250 acres in cultivation:

> *I've got there [Fort Ross] 17,600 acres, 900 head of cattle, 200 horses and 900 sheep. In agriculture I don't work as much as I used to: I had 70 acres of wheat, 70 of oats, 30 of barley, 60 of potatoes, and 20 acres of peas, beans and other vegetables. . .I have a small vehicle which brought some apples from Ross. I've sold my whole apple crop of 20,000 lbs for 12cts a pound.* (Benitz Family Letters, Bancroft Library)

Benitz shipped his crops to Sonoma where there was a market for the apple harvest. In the 1850s, California had limited supply of fruit and the trees from the Russian Orchard had already reached maturity. However, the twenty thousand pound harvest that Benitz recorded is a relatively small harvest for an orchard with over two hundred trees, as one mature full-size tree can produce on average of 800 pounds of fruit in a year.

Similar to the Spanish and the Russians, Benitz primary relied on California Native American people to perform the work on his ranch. He hired workers from the local indigenous villages. In addition, several European Americans were employed to provide skilled services needed in the remote area. The European Americans received four to seven times the salary of the Native people, who earned only eight dollars per month. At this low wage, Benitz found he could hire as many workers as he pleased. In 1855, he described his labor practices to his brother:

> *I have continuously 5 or 6 workers from outside mostly Americans: a hunter, a surveyor, a chief herdsman, a carpenter, a blacksmith and a nurse. They cost from 35 to 60$ a month. The Indians do most of the field-work, as plowing, harrowing, planting and harvesting, they chop wood, drive the carts. Outside the Fort, there is a village of 150 indians, who are obliged by the authorities to work for me at 8$ a month, so I can always have as many as I need. I keep more or less 6 heardsman on horseback, two help in the kitchen. The herdsmen (vaqueros) have to milk the cows, tame young horses.* (Benitz Letters, Fort Ross Conservancy Library)

In the mid-1850s, grain and vegetable production was proving unprofitable and Benitz focused his efforts on cattle ranching and fruit production. At some point he planted additional fruit trees in the Russian Orchard. When the Russians left the fort only 280 trees were recorded on the property, but by 1858, 600 fruit trees were growing on the Benitz land. Benitz created a bold plan to plant a new orchard with three times the number of trees. He wrote his brother describing his ambitions:

> *I am now especially dedicated to the cultivation of fruit-trees. I have an orchard of 450 apple-trees, and 150 of other kind [sic] of fruit. I will have a piece of fenced [land], where I will plant 1800 apple-trees next winter. These trees already give fruit in the second year. Later on I will enlarge my old orchard so as to have 60 acres planted with 6000 trees.* (Benitz Letters, For Ross Conservancy Library)

Benitz completed the first component of his plan. Likely the following year, in 1859, he laid out a rectangular orchard running east to west, less than half a mile to the west of the existing orchard. Benitz drew a plan for his new orchard, with 1700 trees each indicated by a small circle. The trees were laid out primarily in variety blocks of twelve, twenty-four, and forty-eight.

The Benitz Orchard reflects the early commercial fruit production era in California and the nationwide trend of the expansion of fruit varieties. As the distribution of orchards and vineyards expanded in the 1850s and 1860s, new varieties of fruit were brought from the Eastern United States to California. The science of agricultural and fruit production became a common interest both regionally and nationally. The Sonoma County Agricultural Society was established in 1855 to support local farmers. In 1892 the California State Board of Horticulture reported that early Ranch Era orchards were generally "small in extent and mixed in variety" (California State Board of Agriculture 1892, 35). Benitz's plan for his orchard correlates with this statement on the second point as Benitz included 42 varieties of apple trees on his orchard plan:

> *Alexander, Baldwin, Brod River, Canadi Reim, Ducoit, Early Hannis, Esepus [Esopus] Spitzenberg, Fall Beauty, Fancy — , Glori[a] Mundi, Golden Newton Pippin, Golden Russet, Hannis —, Jonathan, Ladies Sweeting [Lady Sweet], Lady Apple, Limber Twig, Maiden's Blush, Milomn, Northern Spy, Oro Pippin, Peck's [Peck's Pleasant] E— Sand, Rambo, Red Jonathan, Reed's — rahan, Roxbury Russet, R—, R— Pippin, Saps of Wind, Saps [Sops] of Wine, Smith's Cider, Summer Pearmain, Swaar, Vandeever Pippin, Virginia Greenings, Wagen[er], White Winter Pearmain, Wine Sap, Wood's Greening, Yellow Bellflower, Yellow Newton Pippin, and, — Greening.* (Stainbrook 1979, 73)

The varieties represent a mixture of cider and eating apples typical of the time period.

No records indicate precisely where Benitz acquired such a broad range of apple varieties. Trees could be ordered

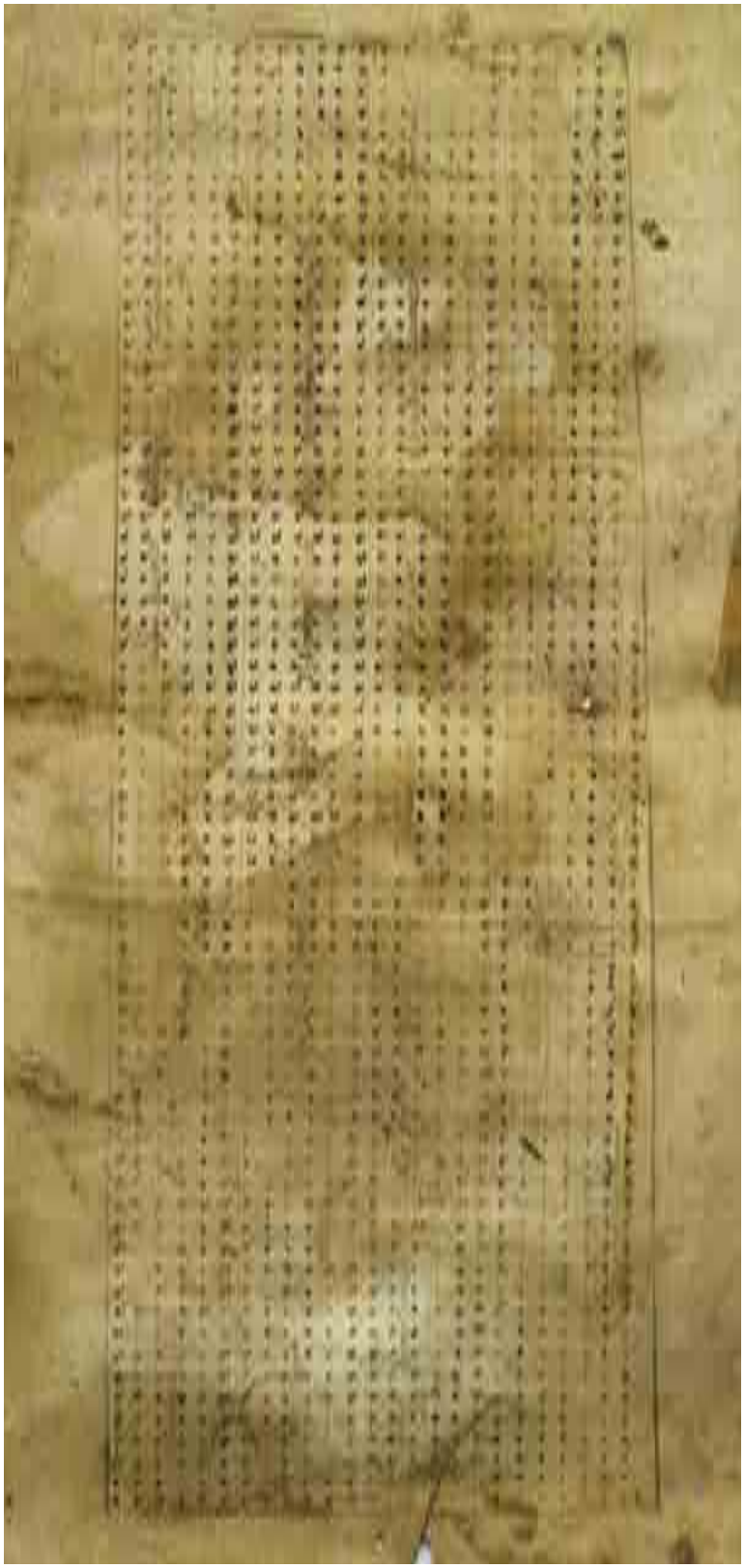


Figure 2.9: *Plan for Benitz Orchard, c. 1859 (Fort Ross Conservancy Library).*

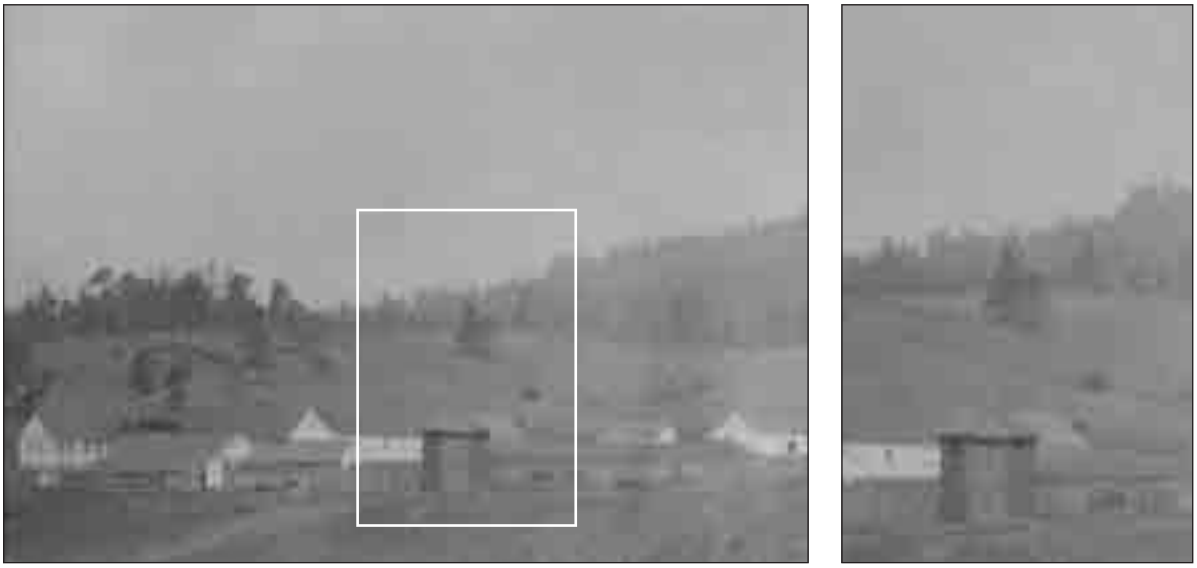


Figure 2.10: *(left) Benitz Orchard on the hill behind the fort, c. 1866 (courtesy of Benitz Family).*

Figure 2.11: *(right) Benitz Orchard close up.*

by catalog from the east coast or obtained from local nurseries. In the 1850s, the first commercial nurseries were established in California from fruit stock brought across the country on wagon trains. These nurseries allowed settlers to establish orchards for both subsistence and commercial production. In 1858, the year Benitz wrote his brother of his plans, the California Farmer, the first agricultural journal in California, reported on the availability of fruit trees for purchase in the state:

> *Wherever we go, into every city and town, we find sales rooms for Fruit Trees, sales rooms for Plants and Seeds. Everybody has become a dealer in Fruit Trees: Ministers, Doctors, Lawyers, and professional men of all classes; there is a perfect mania for this kind of traffic. Every little town in our State, and every auctioneer in such places, are engaged more or less in scattering over our State, these emblems of our Horticultural wealth.* (Sales of Fruit Trees 1858, 12)

As this article demonstrates, fruit trees were widely sold. Benitz in all probability ordered his trees from the catalog of one of the large commercial nurseries on the San Francisco Bay and had them shipped to Fort Ross.

Benitz was also likely able to purchase his trees for a reasonable price. In 1858-1859 nursery owners from

Figure 2.12: *Nursery advertisement from the year Benitz planned his orchard (California Farmer and Journal of Useful Sciences, January 8, 1858, pg. 3).*

Marysville to San Jose formed an agreement to regulate fair prices (Butterfield 1938, 22). In 1856, apple trees sold for approximately six dollars each. By the time Benitz purchased his trees, the nursery owners' agreement had reduced the tree price to 35-50 cents for a one-year-old tree and one dollar for a two-year-old tree.

Even though Benitz was primarily occupied with his other pursuits, he undertook considerable effort to plan and establish the new orchard. Benitz was optimistic about agriculture in California. Encouraging his brother to immigrate to California he wrote:

> *You will see, though, that California is a blessed country. The harvest was good as usual, and people don't know here what a crop failure is. All the sheds are packed with cereals, we can't sell enough. Even if several shiploads full go to Australia, England, China and other countries, there is still abundance here and the prices are very low, in spite of big wages. But still, most of the farmers are well off.* (Benitz Letters 1863, Fort Ross Conservancy Library)

While Benitz refers mainly to grain production, he implies that all agriculture in California is bountiful, including his pursuit of fruit production in the orchard at Fort Ross.

Although Benitz seemed to have achieved substantial success and was filled with confidence, he decided to sell his ranch, hoping eventually to move with his family to Argentina. In 1867, after twenty-four years at Fort Ross, Benitz sold 7,000 acres to James Dixon and another 7,000 acres to Charles Fairfax. The Benitz family moved to Oakland and then to Argentina in 1874, where they established a large ranch.

Fairfax and Dixon

Although Fairfax and Dixon acquired cattle with the purchase of their land from Benitz and established a dairy, their ownership period at Fort Ross is not noteworthy in relationship to fruit production. Charles Snowden Fairfax, a politician from Virginia, likely only visited the property once or twice, while James Dixon, an Irish immigrant, focused his efforts on a timber harvest enterprise. Dixon established one sawmill at Fort Ross Creek and another at Kolmer Gulch, just over one mile north of the fort site. Because agriculture was not a priority and Dixon apparently did not utilize Native American labor for timber production, during this time period, Dixon had the Kashaya Pomo forcibly removed from the land around Fort Ross.[7] In 1873, seven years after purchasing the property from Benitz, Dixon sold the 2500 acres of land that included the remains of the fort and the Russian and Benitz Orchards to George Washington Call. Call's family would own the orchard property for 103 years.

Call Family

George Washington Call was born in Ohio in 1829. He came to California in 1852 to work in the mines. In addition to mining, he was employed as a logger, ranch hand, and hunter. In 1859, after spending several years in San Francisco saving money to travel, G.W. Call left California for South America. While in Chile, Call met and married Mercedes de Leiva. In 1872, they and their four children moved to California. G. W. Call had acquired money in South America from various ventures, including a gunny sack factory, real estate, and railroad building. When he returned to California, he searched for a property upon which he could establish

7 Some of the Kashaya families were able to settle at Haupt Ranch that was owned by the German American Charles Haupt, the husband of Molly Haupt, a Kashaya woman (Rudy 2009, 134).

a commercial venture. He first bought a block, Hampton Place on Rincon Hill in San Francisco. He then found Fort Ross and sold Hampton Place. One year after his return to the United States, Call purchased Fort Ross from Dixon.

When the Calls arrived in Fort Ross, the stockade, two blockhouses, a church, the Rotchev House, the Official Quarters, and a barn from the Russian Era were still standing (Essig 1927, n.p.). Mercedes and George Call, who eventually had nine children, built a house and a school adjacent to the fort. Mercedes Call was an ornamental gardener and also had a particular interest in apple trees. She had an active acquaintanceship with horticulturist Luther Burbank of Santa Rosa and was friends with Mary Black Burdell of Rancho Olompali who had been friends with Josephine Benitz. When the Calls moved into their new house in 1878, Mercedes began a decades-long effort to acquire ornamental plants and plant a large flower garden in front of her house. The family started a shipping enterprise and shipped wood products for neighboring timber harvest operations from their public chute on the deep water cove. In the 1870s, dairying replaced cattle ranching at many farms in Sonoma County. The Calls developed a large dairy on their land and cut native grass hay to feed their dairy cattle. Their primary and most lucrative dairy product was butter, which could be easily shipped to population centers.

In the coastal region around Fort Ross the majority of ranches had a fruit orchard and ranchers sold whatever fruit they did not use. The orchards at Fort Ross provided a secondary source of income for the Calls. Originally, they harvested and sold fruit from the mature trees in the Russian and Benitz Orchards. As they were busy with many forms of enterprise, the Calls performed minimal maintenance on the orchard trees. At the end of the 19th century, G.W. Call informed a visitor that he had only pruned the trees once in seventeen years and that he believed the pruning work had not improved the condition of the trees (True c. 1899, n.p.). The Calls tilled the orchards yearly to encourage the native grasses, which were used as hay. In addition, pigs and cattle grazed in the orchards and ate apples from the ground.

Beginning in the late 1890s, G.W. Call planted up to 1200 new trees in the expanded Russian Orchard (Land of the Apple c. 1899, n.p.). The Calls continued to plant trees into the 1910s. Apple, pear, cherry, plum, and olive trees planted by the Calls from the 1890s to the 1910s survive in the Russian Orchard.

The Calls stored apples in a building called the Apple House until the fruit could be transported (Enduring Orchards and Gardens 1982, n.p.). In the 1870s, schooners began running regularly from the Fort Ross area to San Francisco. Later, steam ships replaced the schooners. Benitz and Call both contributed to the construction of a small road system around Fort Ross, but shipping by water was significantly cheaper than by land. In 1897, apples could be shipped weekly for 12 cents for a 50 pound box (Apples on the Coast 1897, 197). The fruit was transported to the port at San Francisco and sold in the commercial fruit markets near the waterfront. Approximately twenty other orchardists from the region used the facilities at Fort Ross for shipping.

By 1869, the Pacific Railroad was completed and fruit could be transported from Oakland to the central and eastern United States. Eventually steam ship transportation of fruit dwindled. After 1910, big steam ships, loading from offshore, carried only timber products. By the 1920s, both sail and steam ship transportation from the northern California coast had almost stopped. By the 1920s, apples grown north of Fort Ross were trucked to the railroad depot in Cazadero (Hatch 1922, 65).

For the first quarter century of Call ownership, the orchards were productive. In 1899, George Call expressed optimism for agriculture on the coast:

> *The coast of California is decidedly the place for apples. The crop has never yet failed, and on the immediate coast the codling moth is unknown. The fruit has a better flavor, and keeps much longer, than that raised in the interior.* (Very Old Trees in a California Orchard 1899, 253)

Thus, although orchard management was a tertiary activity for Call, he was enthusiastic about its potential.

However, around this time the fruit trees at Fort Ross experienced two significant setbacks, a ferocious windstorm and the destructive 1906 earthquake. In December 1898, a storm hit the northern California coast. It was the most powerful storm G.W. Call had witnessed during his time at Fort Ross. The storm broke windows, blew down the loading chute, and damaged trees in both the Russian and the Benitz Orchards. After the storm, only 463 of the original 1700 trees that had been planted by Benitz remained.

The orchards were damaged again in 1906 when an earthquake shook the coast of California. When the Russians planted fruit trees above Fort Ross, they could not have known that the San Andreas Fault ran directly through the orchard. The 1906 earthquake caused a 300 kilometer long ground rupture from San Juan Bautista to Point Arena. This rupture ran through the Russian Orchard offsetting a nearby fence and the road by 7.5 feet. Before the earthquake, only approximately one-fifth of the Russian Era trees still grew in the Russian Orchard (Munro-Fraser 1880, 370). The earthquake severely damaged several of the remaining Russian Era trees, which at that time were over eighty years old.

Figure 2.13: *Tree damaged by 1906 earthquake. Orchard fence in the background (Fort Ross Conservancy Library).*

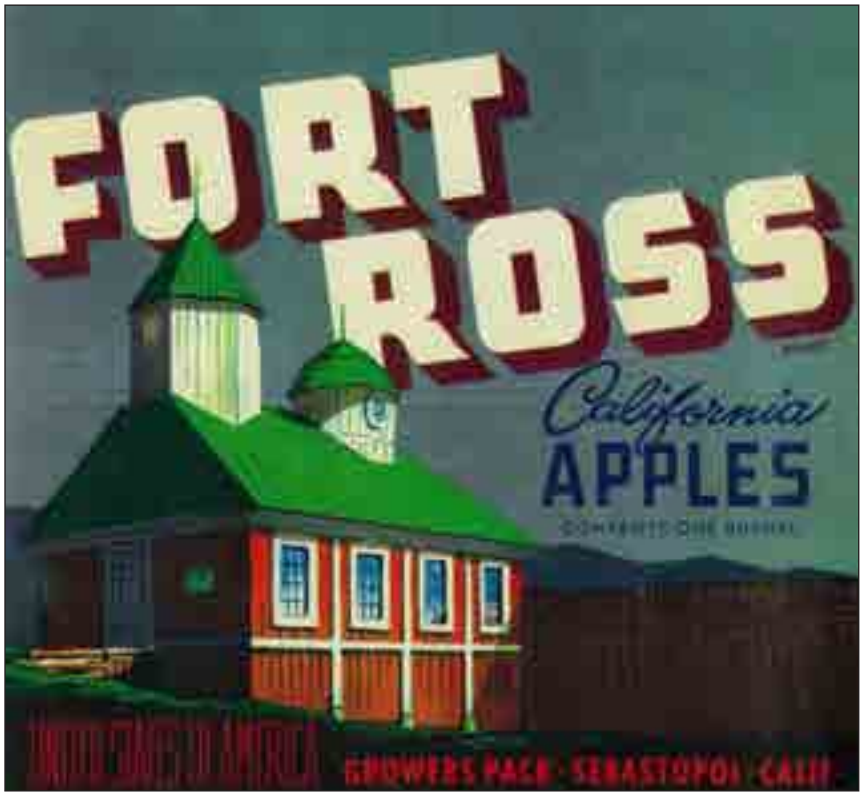


Figure 2.14: *Packing crate label from Sebastopol, California, n.d. (Fort Ross Conservancy Library).*

While these natural disasters reduced the number of trees in the orchards at Fort Ross, economic changes within the fruit industry in California and nationally had a more deleterious effect on the orchards as commercial enterprises. Cattle ranching had dominated early Californian agricultural land use, but fruit production transformed into an equally important industrial system during the late 19th and early 20th centuries. According to a 2007 California Department of Transportation historic context study of agriculture in California, during this period small operations, exemplified by the Call's fruit production venture, had to compete with "the domination of the marketplace by huge enterprises that pioneered mass production, use of machinery, pesticides, fertilizers, and irrigation, and distribution methods based on industrial or scientific models of production" (California State DOT 2007,14). Due to the vastly increased competition and the exodus of the younger generations, small family orchards along the coast including those at Fort Ross, became commercially unviable by the early 20th century.

Figure 2.15: *Interior of a fruit packing plant in Healdsburg, Sonoma County (courtesy Sonoma County Library).*

By the end of the 1800s, fruit production and processing was a central industry in Sonoma County. Local growers joined together to form packing cooperatives to organize fruit production and marketing. The cooperatives enabled smaller farms to compete with large growers and local regions to compete nationally. The packing cooperatives organized development of infrastructure that would support their businesses. Early fruit production facilities in Sonoma County included packing houses in Santa Rosa and Petaluma, a fruit drier in Sonoma Valley, and a cannery in Sebastopol. The Sebastopol growers union exemplified the strength of the cooperatives when they successfully marketed Gravenstein apples in the eastern United States, Australia, and Europe. In the local township, the San Francisco firm of Wetmore Brothers represented commercial fruit growing and distribution out of Annapolis.

The national and international marketing of fruit by local growers was possible because of standardization. The standardization of the fruit industry included the reduction in the total number of varieties grown on individual farms and as a whole. In a 1914 article for the Pacific Rural Press, a San Francisco based agricultural journal published from 1871 to 1922, Sonoma County Horticultural Commissioner E.O. Bremner provided advice for apple production in his region. Foremost among his recommendations was that orchardists should limit the varieties of apple in their orchards. He wrote:

> *Fewer varieties favor a better system of harvesting for the individual grower, and a better understanding of cultural and fertilizing conditions. So the point to be considered with the prospective orchardist is to select the fewest possible varieties that will give the best net results in quantity and quality, and that will bring in the greatest value for the work expended*. (Part 1, 4)

Bremner also provides evidence that many growers were following this advice. At the time the article was written, around half a dozen apple varieties were replacing the over 50 varieties that had been grown in Sonoma County in the past (Part 1, 4). Specific and limited varieties were easier to produce, market, and transport on a large scale.

Figure 2.17: *Wetmore Bros. apple truck on Skaggs Springs Road (c. 1910, courtesy Robert J. Lee, Ukiah, CA).*

The system of fruit production in place in Sonoma County up until the turn of the century allowed for diversity in fruit variety, size, flavor, and overall quality. Bremner wrote, "*The time was, even in this district [Sonoma County], when any old thing sold for an apple and only the top layer counted. It was hard for the packers to turn out straight cars on account of the multitude of varieties. One packer claiming to have shipped fifty-three in a single season*" (Part 2, 28). By 1914, the uniformity of appearance and flavor had become essential features of standardization. Comparing the old system of fruit production to the new system Bremner wrote, "*But now the pack is as near perfect as human skill can make. Doubtful apples are double sorted and not a scale mark, speck of scab, or codling moth stain enters the box*" (Part 2, 28).

The system of fruit production that the Calls originally utilized was considered outdated by the turn of the century. The composition of the fruit trees in the Benitz and Russian Orchards at Fort Ross did not meet the new requirements in commercial fruit production. According to the Call account ledger, the Calls sold at least seventeen varieties of apples: King [Tompkins King], Gloria Mundi, Spitzenberg, Bellflower, Pippin, Swaar, Virginia Greening, Northern Spy, Baldwin, Winesap, Ladies Sweeting [Lady Sweet], Peck's Pleasant, Smith's Cider, Golden N. [Newton] Pippin, Sops of Wine, Alex[ander], and [Winter] Banana (Call Family Papers). More than half of the varieties sold by the Calls correspond to the varieties of the trees planted by Benitz.

Figure 2.16: *Carlos Call, Walter McLeon, Jack Howie, Mrs. Kathryn Call, Ed Eckert, and Fred Sichel harvesting hay at Fort Ross, 1917 (courtesy Sonoma County Library).*

The number of varieties grown by the Calls was less than half of the 42 varieties Benitz planted in the orchard, but still more than the amount recommended for commercial growers of the era. In addition, the fruit from the trees planted by the Russians likely did not correspond to any commercially produced varieties. The diverse tree varieties made the orchard fruit less marketable in an era where uniformity was a central goal of the industry.

In 1903, the Calls sold the property that contained the central Fort Ross compound. The property was soon deeded to the League's Landmarks Fund, who in 1906 gave the site to the State of California so that it could be preserved as a historical park. The Call family retained the majority of their ranch, which included the orchards. George W. Call died in 1907 and Mercedes de Leiva Call died in 1933. In the 1920s, several ranches along the coast began raising sheep instead of dairy cattle. The Call Ranch also transformed its operations. By 1927, Carlos Call, son of George and Mercedes, had sold the majority of the family's cattle and begun ranching sheep. Carlos Call bred Romney and Dorset sheep and remodeled the dairy barn so that it could be used for lambing.

In addition to their expansion of the Russian Orchard, in the 1910s, the Calls planted a small plum, cherry, walnut, and apple orchard to the east of the Russian Orchard. The orchard was up a small logging road and protected from the wind by the redwood forest that surrounded it on three sides. The Calls also planted plum trees around their main house and a small plum and apple orchard next to the Turk House. The Turk House was used at various times by G.W. Call's nephew, the ranch manager, and Carlos Call and his wife Kathryn. It is likely that Carlos and Kathryn planted the small orchard when they lived at the house from 1899 to 1930. The Turk House has since been removed and the location is now known as the Call Picnic Area. The Calls' son George H. Call also planted an apple orchard at his family home on Meyers Grade/Sea View Road. The Calls primarily used the apples they grew for their family and were said to serve applesauce with every meal. Meanwhile, the trees from the original Benitz Orchard continued to die as time went on and were not replanted.

THE HISTORIC RUSSIAN ORCHARD IN THE RANCH ERA

Several historic articles and books include written descriptions of the Russian Orchard. These documents provide a historic record of the condition of the Russian Orchard as time passed. As the Russian Era grew more distant, the historic significance of Fort Ross and the Russian Orchard became increasingly apparent. As early as 1880, the Russian Orchard achieved notice from authors researching the history of Sonoma County.

An early description of the Fort Ross Orchard came from Cyrus Alexander, the manager of Rancho Sotoyome near Healdsburg. In 1843, he sent Frank Bidwell and a Native California Indian to gather plant material from Fort Ross to start an orchard at the rancho. They collected peach pits and cuttings from the orchard that they described as about one acre and surrounded by a redwood plank fence, two inches thick and 15 feet high (Burke 1991, 9 citing Sonoma County Journal march 10, 1867).[8]

An 1880 publication entitled the History of Sonoma County provides a description of the Russian Orchard from the height of the Ranch Era. This description relates information about the orchard fence, fruit species and varieties, fruit taste, and tree condition:

> *…about one mile distance from the fort, there was an enclosure containing probably five acres. It was enclosed by a fence about eight feet high, made of redwood slabs about two inches in thickness. These slabs were driven into the ground, while the tops were nailed firmly to girders extending from post to post, set about ten feet apart. Within the enclosure there was an orchard of fruit trees planted, consisting of apples, prunes and cherry trees. It is stated that all the old stock of German prunes in California came from seed procured at this orchard. The apples were small seedlings, and shaped much as an Eastern 'sheep-nosed June apple,' or rather they were miniature 'bell-flowers.' At present there are about fifty apple and nine cherry trees standing. They are moss covered and gray with age, and many of them*

8 The fence was likely closer to 8 feet high according to later descriptions.

> *have bowed their heads to the ground under the weight of their years. The fruit is still pleasant to the taste, but is small and insignificant, when placed beside the great, grafted, rosy-cheeked giants which are now grown in all of our California valleys. But these Muscovite apples excel no apples at all, and there was a day when they were much sought for in the San Francisco market. The cherries were small and sour, and not of any particular excellence. At present but little care is taken of the trees, and surrounded as they are with the wild forest trees, one is reminded forcibly of some of 'Johnny Appleseed's' famous orchards, planted in the wilds of the Ohio forests, years before the State was settled.*(Munro-Fraser 1880, 370)

According to this description, only around 59 trees from the Russian Era were standing six years after the Calls had moved onto the property and either the Benitz family or the Calls had expanded the Russian Orchard to include five acres of land. The Russian Era trees, which at that time were approximately 60 years old, had begun to deteriorate and

Figure 2.18: *The Russian Orchard in the Ranch Era, 1884 (Fort Ross Conservancy Library).*

their lichen-covered branches were leaning. All the peach trees and grape vines had died. Although pears weren't mentioned, based on future descriptions it is likely that a few pears remained and were misidentified as apples. This account contrasts the "giant," "great," "grafted," and "rosy-cheeked" fruit of newer apple varieties with the "small and insignificant" apples planted by the Russians. The small fruit of the Russian trees is indicative of seedling apples that the Russians obtained from the missions. The trees appeared to be unmaintained although a fence remained around the orchard. Nineteen years after this description was published, G.W. Call was interviewed for a newspaper article on the orchard and gave a similar account of the trees. He stated they were "very old and mossy, and are not very thrifty, but still bear some fruit every year" ("Very Old Trees in A California Orchard" 1899, 253).

By the 1890s, the trees at Fort Ross were already recognized, along with historic mission trees, as some of the "oldest horticultural specimens" in California (Coast Items 1891, 3). Twenty years later few Russian Era trees remained. Sonoma County Horticultural Commissioner E.O. Bremner wrote "about a half dozen old gnarled [apple] trees together with four or five immense seedling cherries" grew in the orchard. He continued that the "apples were very inferior as far as quality is concerned and show unmistakable evidence of being seedlings."(1914, Part 1, 4). Although the trees were recognized as historic, it seems little was done to preserve the trees that were nearing 100 years old.

In 1922, Flora Faith Hatch, who wrote her University of California, Berkeley, history thesis about the Russian settlements in California, visited Fort Ross and the orchard. She described the further deteriorated condition of the Russian Era trees:

> *. . .the orchard is inconspicuous as it present[s] a hoary appearance. The corner of the orchard nearest the road is that of the original Russian planting. Here the apple, pear, and cherry trees have apparently been unpruned for some years and their strength has been absorbed in sending out a tangle of branches from which hang masses of grayish-green moss. About these is a portion of the original fence*

Figure 2.19: *Capulin cherry trees, c. 1912 (Fort Ross Conservancy Library).*

> *built by the Russians. It is likewise overgrown by moss until one does not suspect at first glance that this place once supplied delicious fruit to those who filled the fields below. The tiny knarled fruit that grows on several of these trees is either almost tasteless or else bitter. Only 15 trees have weathered the hundred years since they were planted. But in the midst and spreading over the hillside are trees of more recent planting which bear luscious pears and apples.* (Hatch 1922, 66)

Hatch counted 15 Russian Era trees in the orchard, only just over five percent of the original number. She provides additional evidence that the trees could have been seedling plants based on their "tiny knarled fruit" that were "tasteless or else bitter." Hatch describes the new grafted trees planted by the Calls in the Russian Orchard for the first time. She states that the younger trees were "in the midst" of the Russian trees indicating that the new trees were interspersed with the Russian trees.

Figure 2.20: *Overgrown section of orchard, 1927 (E.O. Essig, courtesy Bancroft Library).*

In the late 1920s, University of California professor of Entomology and Ventura County Farm Advisor E.O. Essig conducted research on the history of Fort Ross orchard. As part of his research, he interviewed Mercedes de Leiva Call, who at that time had been living on the property for 50 years. In addition, he visited the orchard more than once and took photographs of the historic trees. He described the orchard site in a 1933 publication for the California Historical Society. His narrative contains the most detail of any account from the Ranch Era. Segments of Essig's account are interpreted below and it is included in its entirety in the Appendix.

Essig's assessment of the orchard's condition is congruent with Hatch's. Expressing concern over the poor state of the orchard, Essig writes, "There are now trees showing all stages of decay and in many places sprouts show where others once stood." However, he found the apple trees he identified as Gravensteins in the northwest corner of the orchard to be "large, vigorous trees, covered with moss and well laden with delicious juicy fruit." He wrote that both William Benitz and G.W. Call planted trees within the

Russian Orchard and he documented a total of 54 apple, 11 cherry, 43 pear, two prune, five olive trees and several thickets of seedling plums. Essig concluded that only 15 of the trees were of Russian origin: two "Gravenstein" apple, three "Bellflower" apple, four "Russian" pear, and six seedling cherry trees (later identified as Capulin cherries). It is possible that some of these apple and pear trees were, in fact, planted by Benitz in the early Ranch Era. In addition to the two varieties of apple planted in the Russian Era, Essig found several newer varieties of apple that had fruit that was "well colored and of fine appearance except for scab and the work of the codling moth." He also found pear trees that were almost 50 feet tall. Essig's notes from his interview with Mercedes Call indicate that the Calls had planted the olives from seed (Essig 1927, n.p.).

In addition to describing the poor condition of the Russian Era trees, Essig recommended that actions be taken to prevent further deterioration. Essig relates his concern about the condition of the orchard stating:

> *The preservation of the living trees planted by the Russians should be undertaken before it is too late. The speedy acquisition by the state of the entire Fort Ross Ranch would be a great investment for the future. It is nothing less than criminal to allow the present progress of decay and despoliation to continue!* (Essig 1927, 16-18)

Both the Russian and Ranch Era trees continued to decline after Essig's assessment. The orchard went from having 115 fruit trees including up to 15 Russian trees in 1927 to 68 fruit trees in 1979. Essig's recommendation to purchase the orchard property was not carried out until 1976 when California State Parks bought the land from the Call family. This transfer of land ownership ended the management of the site as a component of a working ranch.

Figure 2.21: *Russian Orchard panorama, 1942, one image enlarged into two segments (Frank Adams, courtesy Bancroft Library).*

Table 2.3: Trees Documented in the Russian Orchard, 1833-2014

Year	Number of Trees and Vines	Source
1833	400 fruit trees, 700 grape vines	Vallejo 2000, 12
1841	Main orchard: 260 fruit trees (207 apple trees,29 peach trees, 10 pear trees , 10 quince trees, 8 cherry trees, and some vines) Small adjacent orchard: 20 fruit trees and some vines	Vallejo 1841, John Sutter 1841, and Duflot de Mofras 1842
1858	600 fruit trees (450 apple trees and 150 other fruit trees)	Benitz Letters
1880	59 fruit trees (50 apple and 9 cherry trees)	Munro-Fraser 1880, 370
1914	11 fruit trees ("about a half dozen old gnarled [apple] trees" and 4-5 cherries)	Bremner 1914, Part 1, 4
1922	15 old trees and unknown number of younger apples and pears	Hatch 1922, 66
1927	115 fruit trees (54 apple, 11 cherry, 43 pear, 2 prune, 5 olive,and thickets of seedling plums), including 15 old trees (2 Gravenstein apple, 3 Bellflower apple, 4 pear, and six cherry trees)	Essig 1933, 16-18
1979	68 fruit trees (15apple, 24 pear, 2 plum, 18 prune – European plum, 5cherry, 4 olive) and an additional 53 trees in the hillside above the orchard	Stainbrook 1979, 19-23
2014	43 –historic trees (3 Capulin cherry, 6 apple, 18 Sweet cherry, 4 olive, 9 pear, 3 plum)	-

CALIFORNIA DEPARTMENT OF PARKS AND RECREATION ORCHARD MANAGEMENT

Soon after the orchard land was acquired, park staff and volunteers began to document the Russian Orchard and engage in preservation. In 1979, Park Interpretive Specialist Lynda Stainbrook researched the history of the orchard and created an inventory of the fruit trees. Stainbrook enlisted retired University of California Cooperative Extension Sonoma County Farm Advisor John Smith to volunteer in the orchard.

John Smith and his wife Margaret worked in the orchard throughout the 1980s, initiating an effort to propagate fruit trees from the Russian Orchard trees. In August of 1982 Sebastopol nursery owner Wally Winkler and John Smith took 12-inch cuttings from the apple and pear trees in the orchard. Winkler utilized budding to graft the budwood onto semi-dwarf rootstock. In February of 1984, volunteers planted the 89 "daughter" trees propagated by Winkler from 18 different historic "mother" trees. For the most part, five "daughter" trees were planted around each historic tree. To protect the new trees, Park Rangers and volunteers constructed an eight foot high electric fence around five acres of the orchard in 1983.

During this time period and into the 1990s the orchard gate was locked and the park monitored unauthorized entry and fruit harvest. Rangers, park employees, and local volunteers participated in fence repair, mowing, pruning, and fruit harvest. In 2000-2001, two local volunteers, Lynn Rudy and Susanna Barlow, pruned the trees inside the fence.

In 2007, Susan Rudy became an active orchard volunteer and Fort Ross Conservancy orchard advisor. She developed, wrote, and received grants for a three tiered plan to preserve and protect the orchard. In 2012, Fort Ross Conservancy received funding from Renova Fort Ross Foundation to perform the first phase of orchard stabilization. Wild pigs were removed from the orchard area and the fence was repaired. Keith Park, NPS Arborist, was contracted to prune the oldest trees and train orchard volunteers in preservation pruning techniques. The trained volunteers pruned trees

Figure 2.22: *John Smith and other orchard volunteers repair the new orchard fence, 1985 (Fort Ross Conservancy Library).*

and cleared debris and vegetation from the orchard. Volunteers continue to perform weekly maintenance in the orchard.

The orchards are a living testament to California's rich and varied agricultural history. For 200 years, the Fort Ross Orchards have been used by diverse groups of people to grow fruit in the remote location on the northern California coast. Remarkably, three of the hardiest trees from the Russian Era, the Capulin cherries, survive to this day. In addition, 73 Ranch Era trees planted by the Benitz and the Call families and 92 trees planted in the Contemporary Era continue to thrive. The orchards give us a historical glimpse into the effort the Russian upper management at the fort gave to planning and planting the orchard. In addition, they reflect the contributions of later owners and occupants who acknowledged and commemorated the Russian Orchard's legacy while continuing the practice of fruit production on the site.

CHAPTER 3

EXISTING CONDITIONS

Documenting the existing conditions of historic orchards creates a record for future research and provides a foundation for management decisions. This chapter identifies and describes the existing conditions of the following five orchard areas within Fort Ross State Historic Park based on fieldwork in spring 2014:

1. Russian Orchard
2. Call Orchard
3. Benitz Orchard
4. Call House and Picnic Area Fruit Trees
5. Rotchev House Fruit Trees

Each orchard description is followed by an inventory of the orchard fruit trees based on their period of planting and species. The fruit trees at Fort Ross State Historic Park date from three periods:

- Russian Era (1814-1841)
- Ranch Era (1842-1976)
- Contemporary Era (1976-present)

The Russian Orchard contains trees from all three periods. The Call and Benitz Orchard contain trees from only the Ranch Era, the Rotchev house contains trees from only the Contemporary Era, and the Call House and Picnic Area contains trees from the Ranch and Contemporary Eras.

The data presented in this section was collected during the fieldwork in April, May, and June of 2014. During this time a total of 169 trees were inventoried using the Fruit Tree Condition Assessment Field Form developed

by the National Park Service (see Appendix). In addition to tree assessments, the project team collected GPS data, soil samples, and tree cores. The Fruit Tree Condition Assessment Form provides a template to assess the health of a tree. The form also addresses stressors to the tree in the immediate environment, including the orchard floor, root system, trunk base, main trunk, canopy, and above the canopy.

The Fruit Tree Condition Assessment form defines four levels of tree health as follows:

Good: The tree has new growth at the terminal ends of shoots and only minor physical damage, defects, disease or insect damage, and/or only minor dieback or deadwood present.

Fair: The tree has decreased new growth with moderate physical damage, defects, disease or insect damage, or moderate dieback or deadwood present.

Poor: The tree is in a general state of decline with little or no new growth, major physical damage, defects, disease or insect damage, or major dieback or deadwood present.

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

The condition level can be used to develop stabilization, maintenance, and treatment priorities. For example, a historic tree in poor condition would require immediate stabilization, while a non-historic tree in fair condition would be less of a priority.

NOMENCLATURE

Each Fort Ross fruit tree is identified by an identification label consisting of four components: orchard space; genus and species; era of planting, and tree number. For example, the first Russian Era Capulin cherry tree (*Prunus salicifolia*) in quadrant D of the Russian Orchard would be identified as **D-PsP-1**.

Orchard Spaces

The fruit trees found at Fort Ross State Historic Park are labeled according to their location in one of nine orchard spaces, identified alphabetically as:

A – Russian Orchard (A quadrant)

B – Russian Orchard (B quadrant)

C – Russian Orchard (C quadrant)

D – Russian Orchard (D quadrant)

E – Outside Russian Orchard Fence Line (uphill to the North)

F – Call Orchard

G – Benitz Orchard

H – Call House and Picnic Area

I – Rotchev House

Genus

The Fort Ross fruit trees belong to the following genera and species, identified alphabetically as:

Md = *Malus domestica* (apple)

Pc = *Pyrus communus* (pear)

Pce = *Prunus cerasifera* (European plum)

Pa = *Prunus avium* (Sweet cherry)

Ps = *Prunus salicifolia* (Capulin cherry)

Oe = *Olea europaea* (olive)

Jr = *Juglans regia* (English walnut)

Era of Planting

Following the orchard space and genus and species in the tree label is a capital letter identifying the period in which

the tree was planted as follows:

P – Russian Era (1814 – 1841)

R – Ranch Era (1842 – 1976)

C – Contemporary Era (1976 – present)

RUSSIAN ORCHARD

Setting

The Russian Orchard is located upon an exposed slope overlooking the Fort Ross Compound and the Pacific Ocean at an elevation of 440 feet. The orchard has an open, southerly aspect with dramatic views of the ocean. The prevailing maritime conditions bring sun, fog, salt air and strong winds. The orchard is situated at the edge of open grassland and a narrow clearing within the Coast redwood forest. After having been logged in the late 19th century, the forest has gradually regenerated and is encroaching upon the orchard. The orchard is bounded to the south by exposed, grass-covered pastures that descend towards the coastal bluffs and the Fort Ross Compound. On the steeper uphill slopes above the orchard grow dense, tall stands of native forest trees, including Coast redwood (*Sequoia sempervirens*), Douglas fir (*Pseudotsuga menziesii*), Tanoak (*Lithocarpus densiflorus*), California bay (*Umbellularia californica*) and Madrone (*Arbutus menziesii*), among other species.

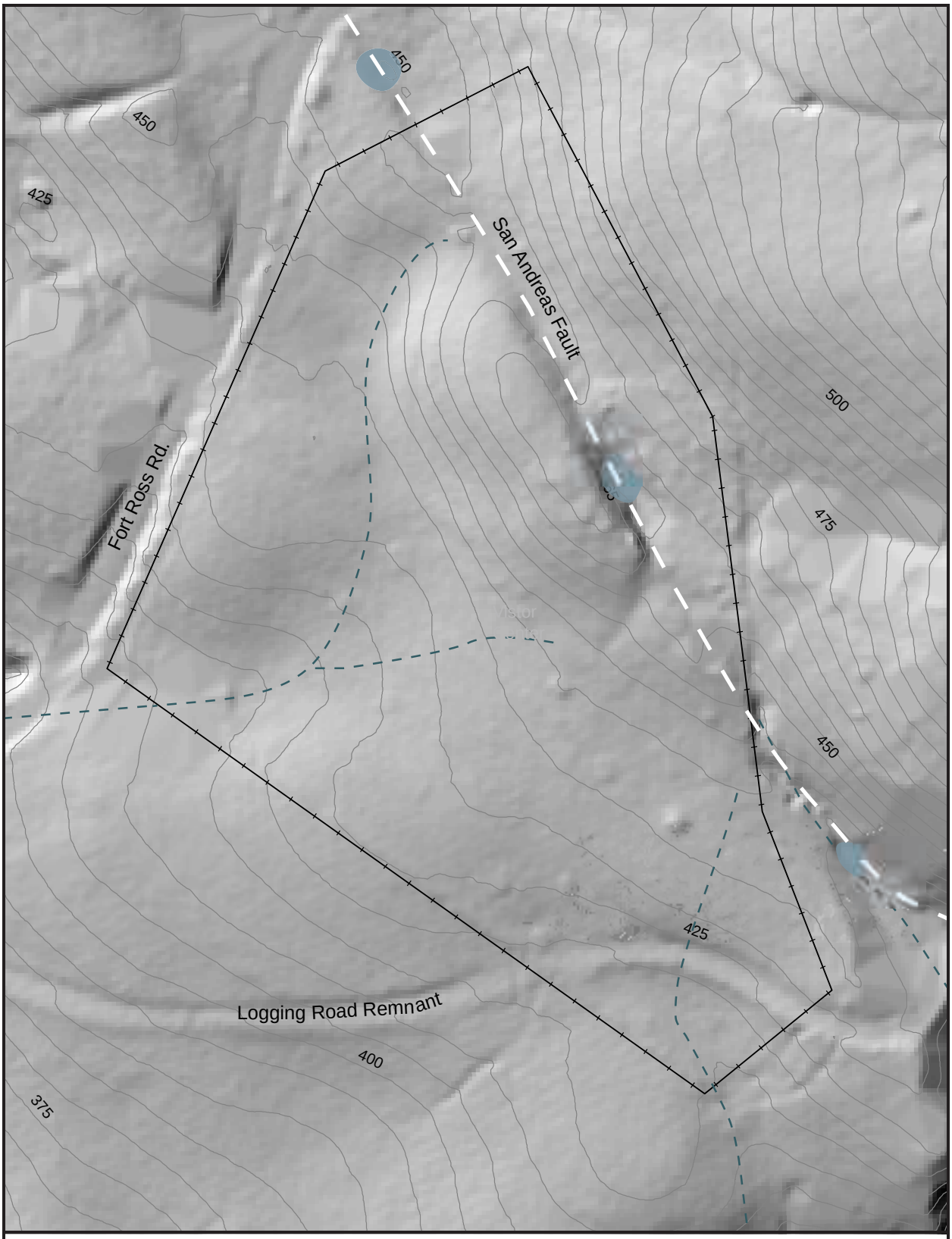
Terrain

The topography within the Russian Orchard is undulating and gently slopes in a southeasterly direction. A shallow drainage runs diagonally through the orchard from the northwest to the southeast. While not a creek, the drainage collects and conveys water away from the orchard. It is located along the toe of a small ridge that was created by seismic uplift of the San Andreas Fault. The fault runs along the upper edge of the Russian Orchard. On the rear side of the fault-line ridge is a deeper and more incised swale that collects water and remains moist for much of the year. The overall effect of this deeper swale is a shady glen that provides groundwater for the fruit trees downslope.

Figure 3.1: *Orchard Management Plan Study Area (CDPR).*

Fort Ross Context Map
Fort Ross Orchard Management Plan

Map 3.1



Drainage Patterns

Sag Ponds

Russian Orchard Topography

Fort Ross Orchard Management Plan

0 100 200 Feet

Map 3.2

Figure 3.2: *Russian Orchard, facing south.*

Vegetation

A variety of native and non-native vegetation exists within the Russian Orchard, including grasses, forbs, sedges, rushes, vines, shrubs and trees. Annual and perennial grasses dominate the orchard floor except in the moist swale north of the fault-line ridge. Horsetail rush (*Equisetum hyemale*), Spreading rush (*Juncus patens*), Blackberry (*Rubus sp.*), Hedge nettle (*Stachys sp.*), Poison oak (*Toxicodendron diversilobum*), Coyote brush (*Baccharis pilularis*), Monkeyflower (*Mimulus sp.*), Douglas iris (*Iris douglasiana*), Coast redwood (*Sequoia sempervirens*) and Buckeye (*Aesculus californica*) grow in this area. In a few locations within the moist swale, clusters of non-native plum tree seedlings or root suckers (*Prunus sp.*) grow invasively, either as offspring or offshoots of nearby parent plum trees.

Four Coast redwood tree groves or 'cathedrals' are located throughout the orchard: three near the upper fence line and one just outside the southwest corner of the orchard near Fort Ross Road. A few plant species are growing over and through the fences that border the Russian Orchard, chief among these are poison oak and blackberry. The grape-stake fence near the gated entrance is especially covered and in some areas is almost completely engulfed by vegetation.

The deer fence has a few trees, shrubs or vines growing up along the base, but generally this fence line has been maintained to be free of vegetation.

Fencing

The Russian Orchard encompasses approximately six acres enclosed by an eight-foot tall post and wire deer and pig fence and a quarter of an acre outside the southeast portion of the fenced area. The fencing was repaired in 2012 as part of a series of grants underwritten by Renova. Three fence posts were replaced, old wire was removed and replaced, and a barbed wire strand was placed at the base to prevent pig rooting. The fence is composed of galvanized wire strung horizontally and spaced 1' apart, with 4"x4" welded wire mesh panels covering the bottom half of the fence. The wire and fence panels are supported at intervals by sturdy wooden poles and metal T-stakes. This game fence imported from New Zealand was chosen to minimize the visual impact to the setting and allow for unobstructed views to and from the orchard while offering protection from deer and feral pigs. Access is provided by an eight-foot wide gate found on the west side of the orchard at Fort Ross Road. Outside the deer fence on the west side and bordering Fort Ross Road is a rustic four-foot tall grape-stake fence, almost entirely obscured by vegetation.

Figure 3.3: *Swale north of fault-line ridge.*

Figure 3.4: *Russian Orchard deer fence and grape-stake fence running parallel to Fort Ross Road.*

Outside the Fence

The fence does not enclose all of the trees planted in the Russian Orchard. Several planted fruit trees grow to the southeast of the fenced area. The area is characterized by a steep, heavily wooded slope bordered by the orchard fence and a sag pond to the south and an open meadow-like clearing to the west. There is no formal grid pattern to indicate an intentional orchard on this slope, although 18 Sweet cherry trees are situated and spaced in a manner that suggests they were intentionally planted. In addition, the two pears and one apple tree in this area are located adjacent to similar Ranch Era trees within the fence. The majority of the fruit trees in this area are located within the redwood forest, while the remaining trees are located on either side of the narrow drainage that terminates in the shallow sag pond.

Other Facilities

Inside the orchard gate to the left is an interpretive wayside with panels on both sides describing the orchard and its history. A wide footpath and occasional vehicle access path leads from the orchard gate and curves to the right through a contemporary block of fruit trees, terminating at a picnic area. This 230 foot long pathway between the gate and the picnic tables represents the only formal circulation route in

the orchard. Shifting mowed paths provide access to some parts of the orchard, while other areas have no specific paths and are accessed overland.

Russian Orchard Fruit Trees

The Russian Orchard contains 108 fruit trees inside the fence and 25 fruit trees outside the fence from all three periods (Russian, Ranch and Contemporary Eras). The lack of uniformity in the appearance of the Russian Orchard is due to its evolution over these periods, each representing different approaches to orchard management. The Russian Orchard contains 129 live fruit trees and five dead trees of the following six species:

- 62 Apple
- 39 Pear
- 4 Olive
- 8 Plum
- 3 Capulin cherry
- 18 Sweet cherry

Three of the trees date from the Russian Era, 43 from the Ranch Era, and 88 from the Contemporary Era. The condition of the trees, as of spring 2014, is as follows:

- 34 are in Good condition (25%)
- 35 are in Fair condition (26%)
- 60 are in Poor condition (45%)
- 5 are Dead (4%)

Overall, the trees do not fit within a regular spatial arrangement or conform to one pruning style. The extant trees have either survived or been planted in clusters, giving the orchard an irregular appearance of tree patches interspersed with open orchard floor. Some spatial patterns exist within the trees of a period, but only the fruit trees from the Contemporary Era conform to a pruning style. The fruit trees from the earlier two periods were not pruned into a

scaffold form. These irregularities are conferred by the long history of the orchard, and different approaches to orchard management over the last 200 years.

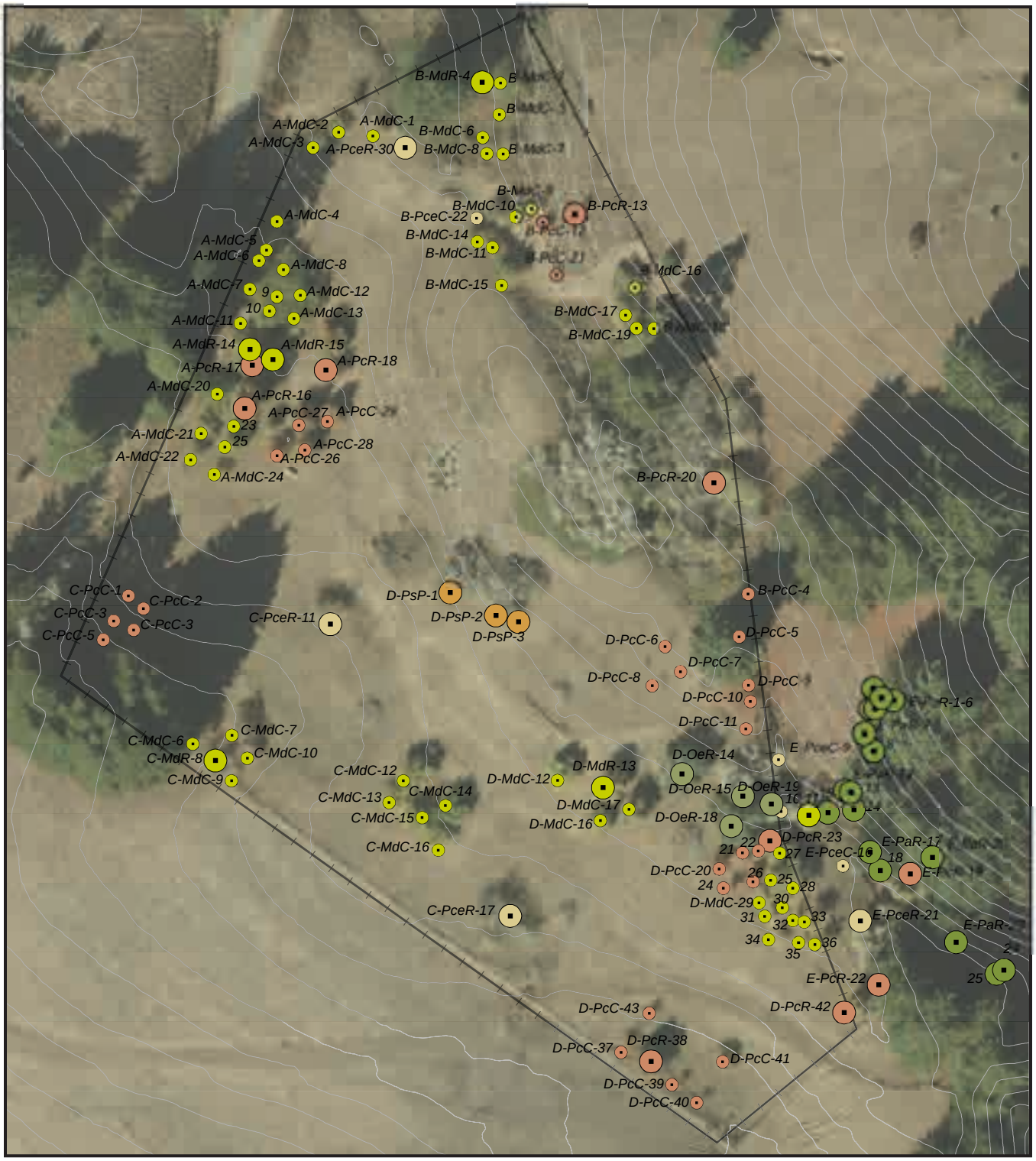
RUSSIAN ERA FRUIT TREES (1814-1841)

The oldest fruit trees in the Russian Orchard and the only trees surviving from the Russian Era (1814-1841) are three Capulin cherry trees (*Prunus salicifolia*). These are located in the center of the orchard on the south-facing slope of the fault-line ridge. They likely date to the 1820s. The trees were planted in a row and they are numbered from west to east. The condition of the trees ranges from fair to poor.

All three Capulin cherries have achieved their mature heights of 20' - 30' tall and thus have only small incremental growth each year. Despite their age, these trees show very few signs of pest and disease. Tip dieback is occurring in the canopies of all three, causing shoots to die back 2"-12" from the tips. This is possibly caused by Bacterial Canker (*Pseudomonas syringae*) or Eutypia Dieback (*Eutypia lata*). However, the common gummosis symptoms (bacterial ooze) associated with these pathogens is not evident. The trees have probably been fighting these common pathogen for years but have been able to withstand the disease and continue to grow.

Structural issues are of greater concern for the longevity these trees. Due to their unpruned, natural growth habits the trees have structural defects such as heavy lateral limbs and unbalanced canopies that can lead to limb breakage and tree failure. Two of the trees have substantially leaning trunks that may be a result of root damage, competition for light, excessive soil moisture or ground movement. All three trees exhibit trunk cracks, splits or loss of bark. The smallest of the three Capulin cherries (D-PsP-3) is the most compromised with only one third of its cambium tissue intact and a severe horizontal trunk lean. This tree is being propped up by the middle Capulin cherry (D-PsP-2) which has prevented it from falling over.

D-PsP-1



FRUIT TREE ERA AND TYPE

- Ranch Apple (6)
- Ranch Pear (10)
- Ranch Plum (4)
- Ranch Olive (4)
- Ranch Sweet Cherry (18)
- Russian Capulin Cherry (3)
- Contemporary Apple (56)
- Contemporary Pear (29)
- Contemporary Plum (4)

Russian Orchard Site Map

Fort Ross Orchard Management Plan

(See Appendix IX for enlarged map)

0 100 200 Feet

SOURCE: Fieldwork June 2014 **DATE:** Dec. 2014

Map 3.3

This Capulin cherry tree is in fair condition with a trunk diameter-at-breast-height (DBH) of 35," making it the largest of the three closely-spaced Capulin cherries.

D-PsP-2

This Capulin cherry tree is also in fair condition with a DBH of 33.5." The main trunk leans substantially uphill but the trunk is braced by a seedling plum tree that functions as a "living prop" supporting the weight of the trunk.

D-PsP-3

This Capulin cherry tree is in poor condition and has a DBH of 19.5."

RANCH ERA FRUIT TREES (1842-1976)

Table 3.1: Russian Era Cherry Trees in the Russian Orchard (3)

Field ID#	Location	Species	Variety	DBH	Condition
D-PsP-1	Russian Orchard	cherry	Capulin cherry	35"	fair
D-PsP-2	Russian Orchard	cherry	Capulin cherry	33.5"	fair
D-PsP-3	Russian Orchard	cherry	Capulin cherry	19.5"	poor

Figure 3.5: *(top, left) Row of three Capulin cherry trees (D-PsP-1, D-PsP-2, & D-PsP-3).*
Figure 3.6: *(top, right) Capulin cherry tree fruit and foliage.*
Figure 3.7: *(below) Capulin cherry tree (D-PsP-1).*

Forty-two trees grow within the Russian Orchard from the Ranch Era, including apple, pear, plum, Sweet cherry and olive species. In addition, two plum trees and one apple tree from the Ranch Era that are dead were inventoried.

Ranch Era Apple Trees (6)

Although most of the apple trunks are hollow, the varieties of the identified apple's present indicate that they were most likely planted in the Ranch Era, rather than the Russian Era. The seven Ranch Era apple trees in the Russian Orchard range in condition from *fair* to *dead* and are the cultivars Rhode Island Greening, Gravenstein, and Baldwin or seedling apples.[9] One dead apple tree stump exists near the deer fence line on the west side of the orchard. It is documented only to establish the distribution of trees during the historic eras.

A-MdR-14 (Rhode Island Greening)

A Rhode Island Greening apple tree of medium height and spread (12" DBH) is located near the pedestrian pathway that leads from the entry gate to the picnic tables. It is in fair condition and is suffering from encroachment and overshading from nearby trees.

A-MdR-15 (Rhode Island Greening)

A Rhode Island Greening apple tree of medium height and spread (9" DBH) is located near the pedestrian pathway that leads from the entry gate to the picnic tables. It is in poor condition and is suffering from encroachment and overshading from nearby trees. The trunk has fallen over and is completely prostrate on the orchard floor. Despite this condition it has managed to produce a new canopy from watersprouts and is in surprisingly fair health.

Both Rhode Island Greening trees exhibit trunk cracks, splits or cavities as well as buried trunk flares. Both have leaning trunks but seem well rooted and stable with relatively full, healthy canopies (80-90% live canopy).

9 See Appendix for genetic testing results from University of California Davis Foundation Plant Services.

B-MdR-4 (Gravenstein)

One Ranch Era apple tree, a Gravenstein cultivar, is located in the northwest corner of the Russian Orchard behind a cathedral of second-growth redwood trees. This apple tree is in poor condition and suffers from severe encroachment of ground vegetation and over-shading from the nearby redwood cathedral. The trunk has a severe lean and may fall over completely if not properly braced. The trunk shows signs of cavities, decay, fungal fruiting bodies and possibly termite infestation. The live canopy is 50% with dieback of terminal branches throughout.

C-MdR-8 (seedling)

Near the southeast section of deer fence is a seedling Ranch Era apple whose fruit shares characteristics of the Newtown Pippin cultivar. The fruit is described as "green, squat and sour". The tree is in poor condition and has completely fallen over to lay prostrate on the ground.

Numerous root suckers surround the main trunk and root damage is evident. The trunk is nearly hollow yet several watersprouts have sprouted along its length to become new leaders so the tree now has multiple trunks growing from one horizontal main trunk. Cavities and fungal fruiting bodies are evident on the main trunk as well. The canopy is 60% live and unbalanced due to a multiplicity of watersprout/ leaders. The foliage is discolored and dieback of terminal shoots is apparent.

D-MdR-13(Unknown variety or seedling)

In the southeast quadrant of the Russian Orchard stands a solitary apple tree. This tree shares characteristics of a Yellow Bellflower apple, but does not genetically match any apple variety within the National Clonal Germplasm Repository in Geneva, New York. Therefore, the tree represents a rare historic variety or is a seedling apple tree.[10] The tree stands approximately 25' tall and the trunk DBH is 25." This tree has the largest DBH of any apple tree within the orchard.

10 Because this tree does not match a variety, there is a possibility that the apple dates from the Russian Era. However, the size of the tree does not indicate that it would be almost 200 years old. Determining the exact age of the tree is not possible because the trunk is hollow.

Table 3.2: Ranch Era Apple Trees in the Russian Orchard (6)

Field ID#	Location	Species	Variety	DBH	Condition
A-MdR-14	Russian Orchard	apple	Rhode Island Greening	12”	poor
A-MdR-15	Russian Orchard	apple	Rhode Island Greening	9”	fair
A-MdR-19	Russian Orchard	apple	-	-	*dead*
B-MdR-4	Russian Orchard	apple	Gravenstein	17.5”	poor
C-MdR-8	Russian Orchard	apple	seedling	15”	poor
D-MdR-13	Russian Orchard	apple	seedling	25”	poor
E-MdR-11	Russian Orchard (outside fence)	apple	-	13.1”	poor

Although it is likely a Ranch Era tree, it could possibly have been planted in the Russian Era. Despite the trunk being completely hollow on the inside, the circumference of the trunk is nearly whole at the base, with adequate cambium tissue to support a canopy that is 70% live and generally healthy. The tree produces many root suckers at or near its base as well as numerous watersprouts on the trunk and scaffold limbs. There is no apparent pruning structure to the scaffold limbs and canopy of the tree. The canopy is unbalanced with increased growth on the sunny south-facing side of the canopy. Many of the smaller scaffold limbs and branches have a decurrent, drooping habit due to a lack of regular pruning and tend to intermingle with branches above and below. Gradually shortening these branches will make them stouter by bringing them closer to the main trunk and making the canopy limbs less prone to failure. If limbs extend too far from the trunk axis breakage may occur, especially under heavy fruit load. The foliage is curled and discolored and leaf spots are also observed. This tree is rated in *poor* condition based primarily on the lack of structural integrity of the trunk.

E-MdR-11(Unknown)

This apple tree is located outside the orchard fence on the west edge of the spring-fed creek. It has a DBH of 13.1” and is in *poor* condition. The eroding creek bank threatens the stability of the tree.

Figure 3.8: *(left) Apple tree (E-MdR-11) growing on creek bank outside orchard fence.*
Figure 3.9: *(top, right) Ranch Era Rhode Island Greening apple tree (A-MdR-15).*
Figure 3.10: *(middle, right) Ranch Era Gravenstein apple tree (B-MdR-4).*
Figure 3.11: *(below, right)Ranch Era seedling apple tree (C-MdR-8).*

Ranch Era Olive Trees (4)

Four olive trees from the Ranch Era are clustered together in a small grove near the southeastern side of the Russian Orchard and they are in fair to poor condition. These trees were propagated from seed and planted by Mercedes Call according to her interview with E.O. Essig in 1927. All but one of the olives are multi-trunked with three to five leaders arising from a large basal burl. Numerous watersprouts emerge from the roots and trunks, as is common among olive trees. One olive tree closest to the deer fence is a single-trunked tree possibly due to overshading from neighboring vegetation and trees. It is possible all the trees were originally trained or grown as single-leader trees but that the single leader since died and was replaced by multiple leaders. Vegetation on the orchard floor is also encroaching upon some of the olive trees. The olives all have significant amounts of deadwood in their canopies and at least one has a large pack rat nest suspended among its branches. Shading and overcrowding of the canopies is the primary threat to these trees, otherwise they are relatively pest and disease free.

Figure 3.12: *Ranch Era olive tree (D-OeR-14) in the Russian Orchard.*

D-OeR-14 (1st olive)

This multi-trunked seedling olive tree is in fair condition with a canopy that is unbalanced but generally healthy.

D-OeR-15 (2nd olive)

This seedling olive tree is in poor condition with a 24" DBH trunk. The canopy is unbalanced with substantial deadwood and retains only 10% live material. The canopy harbors one large pack-rat nest.

OeR-18 (3rd olive)

This seedling olive tree is in fair condition with multiple leaders arising from the basal burl. The main trunk exhibits cracks as well as sapsucker damage. It retains 80% live canopy with unbalanced scaffold limbs and canopy structure due to encroaching vegetation overhead.

D-OeR-19 (4th olive)

This seedling olive tree is in poor condition. It has a single trunk measuring 18.6" DBH and retains 30% of its live canopy and contains a substantial amount of deadwood.

Table 3.3: Ranch Era Olive Trees in the Russian Orchard (4)

Field ID#	Location	Species	Variety	DBH	Condition
D-OeR-14	Russian Orchard	olive	seedling	-	fair
D-OeR-15	Russian Orchard	olive	seedling	24"	poor
D-OeR-18	Russian Orchard	olive	seedling	-	fair
D-OeR-19	Russian Orchard	olive	seedling	18.6"	poor

Ranch Era Pear Trees (10)

Ten pear trees in the Russian Orchard date to the Ranch Era: six cultivars of Vicar of Winkfield, one Bartlett, one variety similar to Vermont Beauty, and two of an unknown variety. A core sample taken from one Vicar of Winkfield tree (E-PcR-22) indicates that it is approximately 102 years old. The pear trees appear to be approximately the same age. Three Vicar of Winkfield pears are grouped together in the west quadrant of the orchard near the pedestrian access path. One Vicar of Winkfield grows at the opposite end of the orchard against the southeast corner of the fence and two grow nearby outside the fence near the spring-fed sag pond. All have comparable trunk diameters and overall character, with the exception of one that has fallen over and formed a long horizontal living "log" from which watersprouts have taken over to form new leaders. The effect is of several short trees growing in close proximity, or even of hedge. The Vicar of Winkfield pears are in *good* or *fair* condition, approximately 30' in height with sound roots and trunks, with the exception of the horizontal Vicar of Winkfield tree. Moss and lichen thrive in the canopies of the Vicar of Winkfield pear trees. A bird species known as the Red-Breasted Sapsucker (*Sphyrapicus ruber*) has pecked numerous small holes into the trunks and scaffold branches of many trees throughout the orchard, including the Vicar of Winkfield pear trees. Though the sapsucker holes are evidently not life-threatening to these trees the damage done by the birds does lend a characteristic texture to the bark and limbs of fruit trees.

A-PcR-16 (Vicar of Winkfield)

This pear is in fair condition and has an 85% live canopy. It is the largest Ranch Era pear tree in the orchard with a 20.5" DBH.

A-PcR-17 (Vicar of Winkfield)

This pear is in good condition with a 14.5" DBH.

A-PcR-18 (Vicar of Winkfield)

This pear tree is in fair condition with an 18" DBH and is located to the left of the footpath that leads from the

Figure 3.13: *Ranch Era Vicar of Winkfield pear trees (A-PcR-16 and A-PcR-17) in the Russian Orchard.*

entry gate to the picnic area. The original main trunk lays horizontal on the ground but is still alive. Several new vertical trunks arise from the main trunk along its length and form a canopy that is 90% live.

B-PcR-13 (Unidentified)

This pear tree is located in the northeast section of the orchard on the open west facing slope to the east of the fault line. The tree has a DBH of 6.5" and is in fair condition.

B-PcR-20 (Unidentified)

This tree is located near the swale north of the fault-line ridge, close to the perimeter deer fence, where it is encroached upon and overshaded by surrounding vegetation. It has a 9.1" DBH and retains 70% of its live canopy. It is in fair condition.

D-PcR-42 (Vicar of Winkfield)

This pear tree is located just inside the deer fence in the southeast corner of the orchard. It is in high fair condition and has a 19" DBH.

D-PcR-38 (similar to Vermont Beauty)

This pear is in poor condition. There are cavities within the 17" DBH and the trunk also exhibits a prominent lean.

D-PcR-23 (Bartlett)

This pear tree is in poor condition. It has a trunk DBH of 11" with only 5% live canopy. The tree is encroached upon by an adjacent seedling olive and plum tree suckers and is indirectly overshaded by nearby redwoods.

E-PcR-19 (Vicar of Winkfield)

This Vicar of Winkfield pear tree is located outside the fence to the east of the spring fed sag pond at the edge of the redwood forest. It has a DBH of 16.8" and is in poor condition. The nearby redwood forest shades the tree and the top of the tree has broken off.

E-PcR-22 (Vicar of Winkfield)

This Vicar of Winkfield pear tree is located just outside the fence and to the west of the spring-fed sag pond. The tree has a DBH of 17.1" and is in good condition although it is shaded on one side by encroaching redwood trees.

Figure 3.14: *(left) Vicar of Winkfield pear (E-PcR-19) growing on the slope above the sag pond.*

Figure 3.15: *(right) Vicar of Winkfield pear tree (E-PcR-22) outside the orchard fence encroached by adjacent redwood forest.*

Table 3.4: Ranch Era Pear Trees in the Russian Orchard (10)

Field ID#	Location	Species	Variety	DBH	Condition
A-PcR-16	Russian Orchard	pear	Vicar of Winkfield	20.5”	good
A-PcR-17	Russian Orchard	pear	Vicar of Winkfield	14.5”	good
A-PcR-18	Russian Orchard	pear	Vicar of Winkfield	18”	fair
B-PcR-13	Russian Orchard	pear	Unknown	6.5"	fair
B-PcR-20	Russian Orchard	pear	Unknown	9.1"	fair
D-PcR-23	Russian Orchard	pear	Bartlett	11”	poor
D-PcR-38	Russian Orchard	pear	Similar to Vermont Beauty	17”	poor
D-PcR-42	Russian Orchard	pear	Vicar of Winkfield	19”	fair
E-PcR-19	Russian Orchard (outside fence)	pear	Vicar of Winkfield	16.8”	poor
E-PcR-22	Russian Orchard (outside fence)	pear	Vicar of Winkfield	17.1”	good

Ranch Era Plum Trees (4)

Four plum trees in the Russian Orchard date from the Ranch Era, including one outside the orchard fence. In addition, two plum trees in the northeast corner of the orchard have died. The plums range in condition from poor to dead. Their cultivar is unknown, possibly cherry plum or seedling fruit. The plum trees are located in disparate sections of the orchard and are not intentionally grouped together. However, a large thicket of Ranch Era plums is located to the east of the sag pond in the central east side of the orchard. The trees in the thicket were not individually documented as part of this project.

A-PceR-30

This plum tree is in poor condition. It is tucked under the lower branches of the northwest redwood cathedral and is encroached upon by surrounding plum tree suckers, vegetation and accumulated debris. The tree has fallen over and is supported by its scaffold limbs, which are resting on the ground. The largest intact scaffold limb measures 13” in diameter at the point nearest the main trunk. Splits and cracks abound on the trunk and scaffold limbs and the extant canopy is 30% live.

B-PceR-1

This tree is dead. It was cut down and exists only as sucker growth from the stump. It is located near the northwest corner of the orchard uphill from the nearby redwood cathedral.

B-PceR-2

This tree is dead. It was cut down and exists only as sucker growth from the stump. It is located near the northwest corner of the orchard uphill from the nearby redwood cathedral.

C-PceR-11

This plum tree is in poor condition. The tree has fallen apart and the scaffold limbs rest on the ground. Numerous watersprouts arise from former limbs and around it grow

many suckers that form a dense multi-trunked thicket. The largest of the surviving scaffold limbs is 24" in diameter.

C-PceR-17

This plum tree is located in the central south portion of the orchard near the fence. It is a multi-trunked tree in poor condition.

E-PceR-21

This plum tree is located near the sag pond outside of the orchard fence. The multi-trunked tree is in poor condition with several fallen and scattered leaders.

Table 3.5: Ranch Era Plum Trees in the Russian Orchard (4)

Field ID#	Location	Species	Variety	DBH	Condition
A-PceR-30	Russian Orchard	plum	Unknown	13"	poor
B-PceR-1	Russian Orchard	plum	Unknown	-	*dead*
B-PceR-2	Russian Orchard	plum	Unknown	-	*dead*
C-PceR-11	Russian Orchard	plum	Unknown	24"	poor
C-PceR-17	Russian Orchard	plum	Unknown	Multi-stem	poor
E-PceR-21	Russian Orchard (outside fence)	plum	Unknown	9.9"	poor

Figure 3.16: *Ranch Era plum tree/thicket (C-PceR-11) in the Russian Orchard.*

Ranch Era Sweet Cherry Trees (18)

Eighteen Sweet cherry trees grow outside the orchard fence on the hillside above the spring. Based on estimates from a partial tree core the trees are approximately 125 years old. The trees are surrounded by a second growth redwood forest. Annual growth rings on a redwood tree located near the cherries indicate that the slope was logged in the late 1880s. The cherry trees were likely planted by the Calls soon after the logging occurred.

Two of the trees are classified as dead, based on the fact that although they had living branches, they had less than 10% of living canopy. All of the other cherry trees are in poor condition because they are heavily shaded by the redwood canopy and have uneven growth patterns as a result.

Figure 3.17: *(left) Sweet cherry tree trunk detail.*

Figure 3.18: *(right) Sweet cherry tree outside orchard fence.*

Table 3.6: Ranch Era Sweet Cherry Trees in the Russian Orchard (18)

Field ID#	Location	Species	Variety	DBH	Condition
E-PaR-1	Russian Orchard (outside fence)	Sweet cherry	Unknown	23”	poor
E-PaR-2	Russian Orchard (outside fence)	Sweet cherry	Unknown	17”	poor
E-PaR-3	Russian Orchard (outside fence)	Sweet cherry	Unknown	18”	poor
E-PaR-4	Russian Orchard (outside fence)	Sweet cherry	Unknown	27.5”	poor
E-PaR-5	Russian Orchard (outside fence)	Sweet cherry	Unknown	19.5”	poor
E-PaR-6	Russian Orchard (outside fence)	Sweet cherry	Unknown	19”	poor
E-PaR-7	Russian Orchard (outside fence)	Sweet cherry	Unknown	17”	poor
E-PaR-8	Russian Orchard (outside fence)	Sweet cherry	Unknown	21.5”	poor
E-PaR-12	Russian Orchard (outside fence)	Sweet cherry	Unknown	8.3”	poor
E-PaR-13	Russian Orchard (outside fence)	Sweet cherry	Unknown	8.5”	poor
E-PaR-14	Russian Orchard (outside fence)	Sweet cherry	Unknown	11”	poor
E-PaR-15	Russian Orchard (outside fence)	Sweet cherry	Unknown	7”	nearly dead
E-PaR-17	Russian Orchard (outside fence)	Sweet cherry	Unknown	8.5”	poor
E-PaR-18	Russian Orchard (outside fence)	Sweet cherry	Unknown	12.2”	nearly dead
E-PaR-20	Russian Orchard (outside fence)	Sweet cherry	Unknown	6.8”	poor
E-PaR-23	Russian Orchard (outside fence)	Sweet cherry	Unknown	7.7”	poor
E-PaR-24	Russian Orchard (outside fence)	Sweet cherry	Unknown	9.8”	poor
E-PaR-25	Russian Orchard (outside fence)	Sweet cherry	Unknown	5.5”	poor

CONTEMPORARY ERA TREES (1976-PRESENT)

Contemporary fruit trees in the Russian Orchard were planted in the 1980s in an effort to stabilize the historic trees and preserve their germplasm. Scion cuttings were taken from historic trees and grafted onto new rootstock and generally planted in the vicinity of the parent tree.

Eighty-nine trees from the Contemporary Era exist in the Russian Orchard inside the fence:

- 56 Apples
  - 38% in Good condition (21 trees)
  - 33% in Fair condition (19 trees)
  - 27% in Poor condition (15 trees)
  - 2% are Dead (1 trees)
- 29 Pears
  - 35% in Good condition (10 trees)
  - 31% in Fair condition (9 trees)
  - 35% in Poor condition (10 trees)
- 4 Plums
  - 100% in Poor condition

Apple cultivars include Baldwin, Rhode Island Greening, and Gravenstein. Pear cultivars include Vicar of Winkfield. Bartlett, and an unidentified variety simliar to Vermont Beauty. In addition, three plum trees from the Contemporary Era grow outside the fence and one grows in quadrant C. These trees were likely volunteers that seeded themselves. They are all in *poor* condition.

With the exception of the plums, the contemporary trees were pruned to establish an open-bowl tree form, whereby new saplings are headed (pruned) to 36" from the ground and wide scaffold branches are selected and trained over several years' time. Primary and secondary scaffold branches are trained from the trunk at 45° angles and fruiting branches or spurs arise from the supporting scaffold branches. Regular annual pruning is required to keep the center of the tree

open and free of foliage so that light and air can penetrate into the canopy.

While the contemporary trees in the Russian Orchard were initially pruned to the open-bowl style, many have lost this character, resulting in trees with a modified central-leader form. These trees were grafted onto semi-dwarf rootstock rather than standard (seedling) rootstocks, resulting in trees that will not achieve the fullness and stature of their parent trees.

Figure 3.19: *(top) Contemporary apple tree (C-MdC-12).*

Figure 3.20: *(below) Contemporary pear tree (A-PcC-29).*

Table 3.7: Contemporary Apple Trees in the Russian Orchard (56)

Field ID#	Location	Species	Variety	DBH	Condition
A-MdC-1	Russian Orchard	apple	Late Gravenstein	6.2”	good
A-MdC-2	Russian Orchard	apple	Late Gravenstein	7.3”	good
A-MdC-3	Russian Orchard	apple	Late Gravenstein	5.6”	poor
A-MdC-4	Russian Orchard	apple	Rhode Island Greening	7.3"	good
A-MdC-5	Russian Orchard	apple	Rhode Island Greening	9.8"	fair
A-MdC-6	Russian Orchard	apple	Rhode Island Greening	6.1”	poor
A-MdC-7	Russian Orchard	apple	Rhode Island Greening	7.1”	fair
A-MdC-8	Russian Orchard	apple	Rhode Island Greening	6.2”	good
A-MdC-9	Russian Orchard	apple	Rhode Island Greening	10.2”	good
A-MdC-10	Russian Orchard	apple	Rhode Island Greening	10.6”	good
A-MdC-11	Russian Orchard	apple	Rhode Island Greening	4.7”	poor
A-MdC-12	Russian Orchard	apple	Rhode Island Greening	11.5”	good
A-MdC-13	Russian Orchard	apple	Rhode Island Greening	9.8”	good
A-MdC-20	Russian Orchard	apple	Rhode Island Greening	10.9”	good
A-MdC-21	Russian Orchard	apple	Rhode Island Greening	8.1”	fair
A-MdC-22	Russian Orchard	apple	Rhode Island Greening	-	fair
A-MdC-23	Russian Orchard	apple	Rhode Island Greening	7.2”	good
A-MdC-24	Russian Orchard	apple	Rhode Island Greening	9.5”	good
A-MdC-25	Russian Orchard	apple	Rhode Island Greening	5.8”	fair
B-MdC-3	Russian Orchard	apple	Gravenstein	10.8”	good
B-MdC-5	Russian Orchard	apple	Gravenstein	6.7”	poor-dead
B-MdC-6	Russian Orchard	apple	Gravenstein	2.8”	poor
B-MdC-7	Russian Orchard	apple	Gravenstein	5.4”	fair
B-MdC-8	Russian Orchard	apple	Gravenstein	-	fair

Field ID#	Location	Species	Variety	DBH	Condition
B-MdC-9	Russian Orchard	apple	Baldwin	4.7”	good
B-MdC-10	Russian Orchard	apple	Baldwin	5.8”	poor
B-MdC-11	Russian Orchard	apple	Baldwin	7.7”	poor
B-MdC-14	Russian Orchard	apple	Baldwin	7.4”	poor
B-MdC-15	Russian Orchard	apple	Baldwin	9.3”	fair
B-MdC-16	Russian Orchard	apple	Baldwin	10.8”	good
B-MdC-17	Russian Orchard	apple	Baldwin	8.4”	fair
B-MdC-18	Russian Orchard	apple	Baldwin	12.2”	good
B-MdC-19	Russian Orchard	apple	Baldwin	11.5”	good
C-MdC-6	Russian Orchard	apple	Unknown	8.1”	fair
C-MdC-7	Russian Orchard	apple	Unknown	8.9”	fair
C-MdC-9	Russian Orchard	apple	Unknown	5.3”	fair
C-MdC-10	Russian Orchard	apple	Unknown	7.5”	fair
C-MdC-12	Russian Orchard	apple	Baldwin	10.9”	good
C-MdC-13	Russian Orchard	apple	Baldwin	8.7”	good
C-MdC-14	Russian Orchard	apple	Baldwin	11”	fair
C-MdC-15	Russian Orchard	apple	Baldwin	9.3”	fair
C-MdC-16	Russian Orchard	apple	Baldwin	9.9”	fair
D-MdC-12	Russian Orchard	apple	Grafted from seedling	11”	good
D-MdC-16	Russian Orchard	apple	Grafted from seedling	8”	good
D-MdC-17	Russian Orchard	apple	Grafted from seedling	11”	good
D-MdC-26	Russian Orchard	apple	Unknown	9.5”	fair
D-MdC-27	Russian Orchard	apple	Unknown	9”	poor
D-MdC-28	Russian Orchard	apple	Unknown	7.75”	fair
D-MdC-29	Russian Orchard	apple	Late Gravenstein	6.5”	poor
D-MdC-30	Russian Orchard	apple	Late Gravenstein	5.75”	poor
D-MdC-31	Russian Orchard	apple	Late Gravenstein	5.25”	poor
D-MdC-32	Russian Orchard	apple	Late Gravenstein	5”	poor
D-MdC-33	Russian Orchard	apple	Late Gravenstein	7”	poor
D-MdC-34	Russian Orchard	apple	Late Gravenstein	-	poor
D-MdC-35	Russian Orchard	apple	Late Gravenstein	5”	poor
D-MdC-36	Russian Orchard	apple	Late Gravenstein	4.75”	poor

Table 3.8: Contemporary Pear Trees in the Russian Orchard (29)

Field ID#	Location	Species	Variety	DBH	Condition
A-PcC-26	Russian Orchard	pear	Vicar of Winkfield	7"	good
A-PcC-27	Russian Orchard	pear	Vicar of Winkfield	10.5"	good
A-PcC-28	Russian Orchard	pear	Vicar of Winkfield	8.4"	good
A-PcC-29	Russian Orchard	pear	Vicar of Winkfield	8.9"	good
B-PcC-12	Russian Orchard	pear	Unknown	5.9"	good
B-PcC-21	Russian Orchard	pear	Unknown	-	-
C-PcC-1	Russian Orchard	pear	Unknown	4.3"	good
C-PcC-2	Russian Orchard	pear	Unknown	4"	fair
C-PcC-3	Russian Orchard	pear	Unknown	4.9"	good
C-PcC-4	Russian Orchard	pear	Unknown	5.7"	good
C-PcC-5	Russian Orchard	pear	Unknown	4.2"	fair
D-PcC-4	Russian Orchard	pear	Unknown	5"	fair
D-PcC-5	Russian Orchard	pear	Unknown	5.5"	fair
D-PcC-6	Russian Orchard	pear	Unknown	3.2"	poor
D-PcC-7	Russian Orchard	pear	Unknown	1.1"	poor
D-PcC-8	Russian Orchard	pear	Unknown	3"	poor
D-PcC-9	Russian Orchard	pear	Unknown	3"	fair
D-PcC-10	Russian Orchard	pear	Unknown	2.8"	poor
D-PcC-11	Russian Orchard	pear	Unknown	2.8"	poor
D-PcC-20	Russian Orchard	pear	Bartlett	5.75"	fair
D-PcC-21	Russian Orchard	pear	Bartlett	6.1"	poor
D-PcC-22	Russian Orchard	pear	Bartlett	3.75"	poor
D-PcC-24	Russian Orchard	pear	Bartlett	4.5"	poor
D-PcC-25	Russian Orchard	pear	Bartlett	5.5"	poor
D-PcC-37	Russian Orchard	pear	similar to Vermont Beauty	4.5"	fair
D-PcC-39	Russian Orchard	pear	rootstock	2.3"	good
D-PcC-40	Russian Orchard	pear	similar to Vermont Beauty	3.5"	poor
D-PcC-41	Russian Orchard	pear	similar to Vermont Beauty	6.5"	good
D-PcC-43	Russian Orchard	pear	similar to Vermont Beauty	4.5"	fair

Table 3.9: Contemporary Plum Trees in the Russian Orchard (4)

Field ID#	Location	Species	Variety	DBH	Condition
C-PceC-22	Russian Orchard	plum	Seedling or rootstock	-	-
E-PceC-9	Russian Orchard (outside fence)	plum	Seedling or rootstock	5.8”	poor
E-PceC-10	Russian Orchard (outside fence)	plum	Seedling or rootstock	7.1”	poor
E-PceC-16	Russian Orchard (outside fence)	plum	Seedling or rootstock	6.6”	poor

CALL ORCHARD

The Call Orchard is located ½ mile east of the Russian Orchard and is approximately 1.8 acres in size. It is not enclosed by a fence and is frequented by grazing cattle and wildlife. All of the trees in the Call Orchard are from the Ranch Era. There are 18 fruit trees located in the Call Orchard, including:

- 2 Apple
- 13 Plum
- 2 Sweet cherry
- 1 Walnut

The condition of the fruit trees ranges from fair to dead with:

- 11% in *Fair* condition (2 trees)
- 83% in *Poor* condition (15 trees)
- 5% are *Dead* (1 tree)

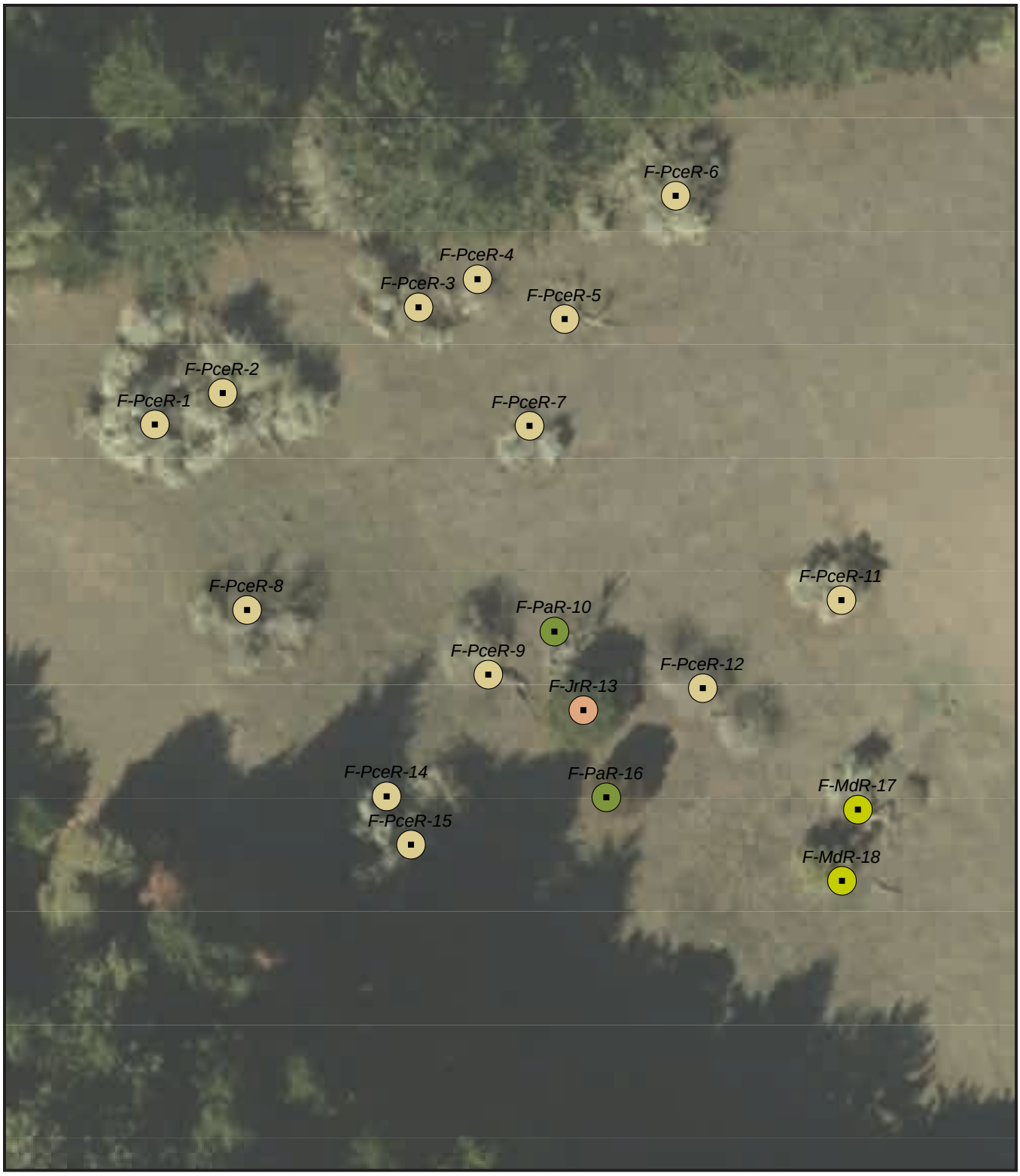
The arrangement of fruit trees in the Call Orchard is scattered, with only vague indications of an organized arrangement or intentional spacing between trees. The majority of the trees are plum trees that are large and sprawling due to multiple stems that have failed and fallen away from the main trunk to become new dominant leaders. Core samples from F-PceR-14 indicate that the plum trees are around 100 years old.[11] In two locations near the lower corners of the orchard, individual plum trees have spread out and merged with neighboring plum trees forming larger tree clusters. The stout, horizontal branches and limbs of these plum trees offer a measure of protection from cattle as well as wildlife, shielding the interior of the canopy from grazing and trampling.

11 Estimate based on a partial core with 91 rings.

Figure 3.21: *Call Orchard plum tree thicket (F-PcdR-15).*

The cherry, walnut and apple trees in the Call Orchard are grouped closer to the center of the orchard in a loose arrangement with ample spacing between trees. Of these, only the solitary English walnut tree is in fair condition, all of the others are in a state of decline. One apple tree at the upper northern edge of the Call Orchard is dead as the trunk and canopy have broken off completely, however new growth that arises from the base of the trunk appears viable but is regularly grazed down by animals.

Access to the Call Orchard is by a footpath through the redwood forest. Accessing the footpath itself requires walking outside the Russian Orchard deer fence to the north and connecting with the footpath beyond the sag pond. The route is currently challenging for potential visitors to the Call Orchard.



FRUIT TREE ERA AND TYPE

- Ranch Apple (2)
- Ranch Plum (13)
- Ranch Walnut (1)
- Ranch Sweet Cherry (2)

Call Orchard Site Map

Fort Ross Orchard Management Plan

0 50 100 Feet

SOURCE: Fieldwork June 2014 DATE: Dec. 2014

Map 3.4

Table 3.10: Ranch Era trees in the Call Orchard

Field ID#	Species	Variety	DBH	Condition
F-Pce-R-1	plum	Rootstock or seedling (Yellow fruit)	-	poor
F-Pce-R-2	plum	Rootstock or seedling	-	poor
F-PceR-3	plum	Rootstock or seedling	-	poor
F-PceR-4	plum	Cultivar (Red fruit)	12"	poor
F-PceR-5	plum	Cultivar or seedling (Red fruit)	4.3"	poor
F-PceR-6	plum	Rootstock or seedling	-	poor
F-PceR-7	plum	Rootstock or seedling (Yellow/pink fruit)	14.8"	poor
F-PceR-8	plum	Rootstock or seedling	-	poor
F-PceR-9	plum	Rootstock or seedling	11.2"	poor
F-PaR-10	Sweet cherry	Unknown	20"	poor
F-PceR-11	plum	Rootstock or seedling (Red fruit)	31.6	poor
F-PceR-12	plum	Rootstock or seedling (Yellow fruit)	-	poor
F-JrR-13	English walnut	Unknown	22.5"	fair
F-PceR-14	plum	Rootstock or seedling	14.5"	poor
F-PceR-15	plum	Rootstock or seedling	-	fair
F-PaR-16	cherry	Rootstock	12.6"	poor
F-MdR-17	apple	Unknown	29"	dead
F-MdR-18	apple	Unknown	11.3"	poor

BENITZ ORCHARD

The Benitz Orchard area is located approximately one mile due west from the entrance to the Russian Orchard at Fort Ross Road. This orchard contains only one remaining fruit tree from the Ranch Era: an apple tree possibly planted by William Benitz around 1859. This fruit tree is the remainder of a much larger 20-acre orchard that once sprawled across the landscape in orderly rows and contained 1,700 trees. The tree stands in a clearing that is gradually being reclaimed by the surrounding forest.

The University of California Davis Foundation Plant Services identified the tree as sharing genetic markers with the Crimson Gold variety (see Appendix III). The Crimson Gold cultivar was developed in 1944 by Albert Etter and George Roeding Jr. at the California Nursery Company in Fremont, California, long after the Benitz Orchard was planted (Greenmantle Nursery 2005, n.p.). The Crimson Gold cultivar could indicate that the tree is under 70 years old. However, it is unlikely that fruit trees were planted in

Figure 3.22: *Benitz Orchard apple tree (G-MdR-1).*

this area in the 20th Century. The Crimson Gold is a cross of a Yellow Newton Pippin and Esopus Spitzenburg, which were both planted in the Benitz Orchard. Therefore, the Crimson Gold genetic marker could indicate that the tree was originally labeled as one of these two cultivars or that it is a volunteer hybrid tree resulting from an inadvertent cross of the two cultivars.

The Benitz Orchard tree is in fair condition with a DBH of 14." The trunk is visibly hollow on one side, with a cavity near the base. The canopy is fairly healthy (85% live) however, indicating healthy tissue within the cambium. The scaffold branching pattern is that of the open-bowl style, however the branches within the canopy have assumed the characteristic "umbrella" shape of formerly maintained fruit trees that have been browsed by wildlife and received no maintenance for many years. The tree still produces fruit.

Table 3.11: Ranch Era tree in the Benitz Orchard

Field ID#	Species	Variety	DBH	Condition
G-MdR-1	apple	Similar to Crimson Gold	14"	fair

CALL HOUSE AND PICNIC AREA

Two areas of fruit trees are located adjacent to Call House and adjacent to the location of the former Turk House which is utilized as a picnic area. A creek flows between the two areas. Fourteen fruit trees grow in the Call House and Picnic Area that date from the Ranch and Contemporary Eras. Twelve fruit trees are located in the Picnic Area and two are located behind the Call House. According to a Call descendant, Carlos Call's housekeeper planted the trees adjacent to the Call House in the 1970s.

The Picnic Area contains seven plum trees and five apple trees and the Call House contains two plum trees. The 14 fruit trees in this orchard area range from *good* condition to *dead*:

- 7% in *Good* condition (1 tree)
- 14% in *Fair* condition (2 trees)
- 71% in *Poor* condition (10 trees)
- 7% are *Dead* (1 tree)

The Picnic Area is shaded by a large grove of Eucalyptus and Monterey cypress trees planted as a windbreak to the northwest of the Call House. The generally poor condition of the trees in the Picnic Area can be attributed to several factors including overshading of these windrow trees, accumulated debris on the orchard floor and encroaching groundcover vegetation.

Two Ranch Era apple trees have fallen over but are still connected to their roots by a thin strip of conductive tissue that allows them to produce new foliage and even some fruit. A third Ranch Era apple tree is still standing but is in very poor condition. The three Ranch Era apple trees appear to be high-headed with main trunks taller than 36," indicating they were likely not trained in the open-bowl style.[12] Two remaining apple trees from the Contemporary Era are in *fair* condition despite severe encroachment by groundcover vegetation. These may have been initially pruned in an

12 F. Kaye Tomlin, a Call family descendant, identified the apple tree varieties as Arkansas Black, but these apple trees have not been definitively identified.

open-bowl structure but lack of maintenance has obscured these efforts.

The plum trees in the Picnic Area are all overshaded by the Eucalyptus windrow and are in decline. Stretching to capture light has caused many trees to lean severely, with long main trunks and intertwining scaffold branches, deadwood and thin canopies. Plum tree H-Pce-R-2 is located at the edge of a newly installed pedestrian path and may incur root damage from soil compaction.

Two plum trees are located across the creek from the Picnic Area behind the Call House. The larger plum is multi-stemmed with a robust canopy that grows above an adjacent garage structure and Ranger's quarters. One stem of this tree has a fungal fruiting body but the tree is otherwise in good condition. The smaller Call House plum tree has several small diameter leaders arising from a leaning main trunk. The new leaders' upright growth has adjusted for the leaning main trunk. This area is actively used by residents of the Ranger's quarters and regular pruning of this Call House plum tree has produced a rounded canopy that is above head height.

Table 3.12: Call House & Picnic Area Trees

Field ID#	Species	Variety	DBH	Condition
H-PceR-1	plum	Unknown	6.4"	poor
H-PceR-2	plum	Unknown (Red fruit)	6.5"	poor
H-PceR-3	plum	Unknown	7.3"	poor
H-PceR-4	plum	Unknown	21.2"	poor
H-PceR-5	plum	Unknown	8.8"	poor
H-PceR-6	Japanese plum	Unknown (Red fruit)	12.3"	poor
H-PceR-7	plum	Unknown	12.4"	dead
H-MdR-8	apple	Bellflower	10.7"	poor
H-MdR-9	apple	Unknown	13"	poor
H-MdR-10	apple	Unknown	14.7"	poor
H-MdC-11	apple	Unknown	2"	poor
H-MdC-12	apple	Unknown	4.2"	fair
H-PceR-13	plum	Unknown (Red fruit)	20"	good
H-PceR-14	plum	Unknown (Green fruit)	9.5"	fair

FRUIT TREE ERA AND TYPE

- **Ranch Apple (3)**
- **Contemporary Apple (2)**
- **Ranch Plum (9)**

Call House and Picnic Area Site Map

Fort Ross Orchard Management Plan

0 50 100 Feet

SOURCE: Fieldwork June 2014 DATE: Dec. 2014

Map 3.5

ROTCHEV HOUSE

Two Contemporary Era apple trees are located within the walls of the Fort Ross stockade, outside the entrance to the Rotchev House. The trees are spaced 15 feet apart and provide a shady sitting place for park visitors. Both trees are in good condition with healthy new growth and 90% full canopies. Neither tree has a distinct structure or a pruning style: both appear to have been shaped haphazardly with no particular structural training in mind. Tree I-MdC-1 has a high canopy on top of two narrowly-spaced leaders arising from a short 24" main trunk. Tree I-MdC-2 has a taller 48"main trunk with several randomly arranged and unbalanced scaffold branches lower on the trunk. The new growth is healthy and no diseases or pests are present.

Soil compaction within the root zone from foot traffic is a concern, but the trees seem unaffected at this time. A compacted-base walking path was recently installed between the apple trees and the Rotchev House that has raised the grade on one side of the apple trees and could cause root deterioration. A tree core sample taken from tree I-MdC-1 indicates this tree is approximately 50 years old and was planted in the mid-1960s by CDPR, in an effort to beautify the setting of the Rotchev House.

Table 3.13: Contemporary Era Apple Trees at the Rotchev House

Field ID#	Location	Species	Variety	DBH	Condition
I-MdC-1	Rotchev House	apple	Unknown	15"	good
I-MdC-2	Rotchev House	apple	Unknown	10.5"	good

Figure 3.23: *(left) Rotchev House apple tree (I-MdC-2).*

Figure 3.24: *(right) Rotchev House apple tree (I-MdC-1).*

CHAPTER 4

ANALYSIS AND EVALUATION OF INTEGRITY

The historic integrity of a property represents the property's ability to convey the historic aspects for which it is significant. The National Register of Historic Places utilizes seven aspects to evaluate the integrity of a property:

Location – the place where the cultural landscape was constructed or the landscape where the historic event occurred;

Design – the combination of elements that create the form, plan, space, structure, and style, and the style of a cultural landscape;

Setting – the physical environment of the cultural landscape;

Materials – the physical elements that were combined or deposited during the particular period(s) of time and in a particular pattern or configuration to form the cultural landscape;

Workmanship – the physical evidence of the crafts of a particular culture or people during any given period in history or prehistory;

Feeling – a cultural landscape's expression of the aesthetic or historic sense of a particular period of time;

Association – the direct link between the important historic event or person and a cultural landscape. (Excerpted from *National Register Bulletin 15: How to Apply the National Register Criteria for Evaluation*)

These aspects of integrity can be used to evaluate the property as a whole, as well as to evaluate the individual resource components, such as a building or a single fruit tree. While the orchards at Fort Ross are part of the overall historic landscape including the fort itself and the surrounding fields, this document looks at how the orchards specifically express the historic significance of the property. The orchards at Fort Ross have not been moved and the landscape around the orchards remains undeveloped. The orchards maintain a similar relationship with the central fort and the surrounding environment as they had during the period of significance. Therefore the orchards possess integrity of setting and location. In addition, the historic fruit trees possess a form reflective of historic orchard practices and therefore they contribute to the integrity of materials. The orchards lack integrity of design, as only a small portion of the historic trees remain and thus the overall layout of the property has been altered. The orchards possess integrity of feeling and association because they reflect unique characteristics of the Russian and Ranch Eras and have a strong link to the historic land use.

The historic integrity and significance of a cultural landscape is evaluated based on historic characteristics of the landscape (the pertinent characteristics of the Fort Ross orchards include Vegetation, Buildings and Structures, Archaeological Sites, Constructed Water Features, and Small Scale Features) and the broader environmental and cultural context (Circulation, Cluster Arrangement, Cultural Traditions, Land Use, Topography, Natural Systems and Features, Views and Vistas, and Spatial Organization). The Fort Ross orchards contain elements from the Russian, Ranch, and Contemporary Eras. In order to evaluate the historic integrity of the property, it is necessary to understand the character of the property within the period of significance and to define exactly how the different periods are represented in the current landscape. Three characteristics are integral to the historic character of the Fort Ross orchards and fruit trees: Spatial Organization (site layout and tree spacing), Land Use (fruit production and ranching), and Vegetation (fruit tree species, variety, and form). These landscape characteristics reflect the most

Figure 4.1: *Visual connection from Russian Orchard to Fort Ross.*

essential features associated with the property's historic significance. In addition, Archaeological Features and Small Scale Features relate to details of landscape development and use, while, Natural Systems and Features express environmental continuity at the property.

SPATIAL ORGANIZATION

Spatial organization consists of the layout of the property through design and land use. The entire Fort Ross property has a hierarchy of organization based on the overall historic development. During the Russian Era, the Fort Ross property was arranged outward from the central fort. Lightfoot, Wake, and Schiff describe the four ethnic zones related to the spatial organization of the Fort Ross development (1991, 22-24). They delineate the stockade compound, the Russian village to the west, the Alaska Native neighborhood to the south, and the Native California Indian neighborhood to the north. The Native California Indian neighborhood includes housing sites adjacent to the orchard. The stockade held the densest level of construction and management activities and housed the highest ranking Russian-American Company employees. The area surrounding the stockade was a mix of Alaska Native and Russian housing, small-scale

industry (ship construction, blacksmith), and personal agricultural plots. Further from the fort, Native California Indian housing sites were interspersed with cultivated land, grazing areas, and forest. Trails led from the stockade to the peripheral developments. The radial development pattern with the fort area at the center was continued in both the Ranch and Contemporary Eras. The relationship of the Russian Orchard to the central fort area had been maintained through both the road system and through visual connection.

The spatial organization of the orchards themselves consists primarily of the distribution and grouping of fruit trees. The organization of fruit trees reflects the historic tree spacing during the period of significance as well as the effort to preserve genetic material through planting new grafted trees in the 1980s.

Russian Orchard

Two Russian orchards were inventoried at the time of sale. In 1841, the larger orchard contained 260 fruit trees and the smaller contained only 20. Both orchards contained grape vines. The larger orchard was 385 feet by 168 feet. It was associated with a house that was 31.5 by 28 feet and had a 17.5 square foot kitchen. The smaller orchard was located nearby and was 98 feet by 73.5 feet long.

Tree Spacing

As mentioned earlier, descriptions from the Russian Era present a view of the Russian Orchard as varying between over-planted and well-organized. Based on the 1841 inventory, the larger orchard was just under one-and-a-half acres and the smaller orchard was about one-sixth of an acre. Excluding the grape vines, if the 260 fruit trees

Figure 4.2: *Orchard panorama below the ridgeline (Capulin cherries in center left, picnic area right).*

were distributed evenly within the larger orchard, each tree would have been planted approximately 16 feet on center. In the smaller orchard, each tree would have been planted approximately 19 feet on center. The trees, however, were not distributed evenly. Khlebnikov wrote that over 100 trees were planted in "one line next to the fence" (1990, 102). Assuming that they were planted along the longest side of the orchard fence, the trees would have been only 3.85 feet apart. The actual distance between trees in the larger orchard was likely somewhere between 3.85 and 16 feet. The two closest Capulin cherry trees are spaced approximately 12 feet apart. It is possible that many of the trees within the orchard were likewise distributed.

Orchard Boundary

The exact location of the Russian Orchard's historic boundary is not known. The three remaining Russian Era trees provide the most substantial evidence of the location of the orchard. These Capulin cherry trees stand in a row at the foot of the slope in the center of the present day orchard. They may have been planted with the original group of trees in a row along the fence. In that case their location would correlate to one edge of the original Russian Orchard. In addition to the cherry trees, an archaeological site located outside the orchard fence on the southeast side of the orchard along the San Andreas fault line could represent the location of the orchard house (see Archaeological Sites). If the archaeological site does correspond to the location of the Russian Era house, as archaeologists Farris and Parkman posit, then the boundary of the orchard could extend from this location. However, currently the terrain between the archaeological site and the Capulin cherry trees is uneven. It is possible that before the 1906 earthquake, the slope was more gradual and the landscape could have accommodated an orchard. The orchard also could have been located to the south of the Capulin cherries in a large open area with a low-angled slope. Thus, the house site would have been located adjacent to, rather than within, the orchard.

Figure 4.3: *Orchard spacing, 1927 (E.O. Essig, courtesy Bancroft Library).*

Ranch Era Orchard Layout

During the Ranch Era, the original Russian Orchard was expanded to include a larger area. A total of 42 Ranch Era fruit trees are located within the current orchard fence and outside the fence on the southeast corner of the orchard. As many as 1200 trees occupied this space in the Ranch Era. Groups of surviving trees provide an indication of the historic spacing. Ranch Era trees grow from 15 to 30 feet apart. The surviving trees are located in small groups or stand alone in the orchard. A group of historic pear and apple trees grow to the north of the picnic area, a group of olive trees grow near the southeast border of the fence, a group of Sweet cherry trees grows in the forest outside the fence, and a large massing of plum trees grows to the east of the sag pond within the orchard. Photographs from the Ranch Era indicate that the entire orchard was not planted with fruit trees. In these photographs, large open areas are located within the midst of groups of large unpruned trees. After the 1920s, trees within the orchard were likely not replaced and the distribution gradually became more open.

Contemporary Orchard Layout

The contemporary plantings made in the 1980s increased the density of fruit trees in the Russian Orchard from the

Figure 4.4: *Aerial photograph depicting tilled area in the location of the Benitz Orchard, 1978 (CDPR).*

Ranch Era. The semi-dwarf fruit trees were planted 14 to 20 feet apart in a loose grid pattern around each "parent" tree. While the spatial organization of the property was altered through the introduction of the young trees, large open areas were left unplanted between tree groupings reflecting the character of the orchard in the later Ranch Era.

Benitz Orchard

The Benitz Orchard, as it was established for commercial purposes, represents the only orchard that has a historic planting plan. Variety groups of 12, 24, and 48 apple trees were planted in an open field to the west of the Russian Orchard in a grid pattern. The area of the orchard was over 20 acres (approximately 1800 to 2000 feet long by 500 to 750 feet wide). Each tree was therefore planted 23 to 30 feet on center. Many of the Benitz trees did not reach maturity. Forty years after the Benitz Orchard had been planted, only 463 of the trees remained. The dead trees were not replaced and the orchard continued to decline. By the time the park acquired the property, only a fraction of the Benitz trees remained. In 1979, five trees were counted in the Benitz Orchard and by 1990, four trees remained. In 2014, only one apple tree is extant.

A rectangular furrow pattern in the location of the Benitz Orchard is visible on historic aerial photographs from the 1960s to the 1980s. This pattern appears similar to the

original orchard grid. The Calls used the Benitz Orchard for hay production and likely plowed the field in the same pattern as the original rows of trees. Today, however, the furrow pattern is no longer visible from aerial imagery. The only historic remnant of the Benitz Orchard is the one remaining apple tree.

Table 4.1: Trees Documented in the Benitz Orchard, 1859-2014

Year	Number of Apple Trees	Source
1859	1700	Benitz Orchard Plan
1898	463	Call
1979	5	Stainbrook 1979, 28
2014	1	OMP Project Team

Call Orchard

No historic drawings or descriptions of the Call Orchard have been identified, thus it has not been possible to determine the original layout of the orchard. The trees in the Call Orchard date to the 1910s. The trees are distributed in an open area on the bottom of a large slope surrounded on three sides by redwood forest. The 18 remaining trees grow in an asymmetrical pattern with open space between each tree. The majority of trees are large multi-trunk plums. In addition, two apples, one Sweet cherry, one seedling cherry, and one English walnut grow in the southern portion of the orchard. The distribution and spacing of the trees continues to reflect the use of the orchard by the Call family for non-commercial purposes.

Figure 4.5: *Call Orchard panorama.*

LAND USE

Land use is expressed through activities (plowing a field) and the physical reflections of those actions (a plowed field). Fruit tree production as a land use activity reflects both the Russian and Ranch Eras at Fort Ross. Up until 1976 the Fort Ross orchards were part of a working ranch. Over the years the ranch families harvested fruit from the orchards, plowed the orchards for hay, and grazed cattle and sheep under the fruit trees.

The character of the land continues to reflect agricultural land use even though it is no longer associated with a working ranch. Cattle owned by a local rancher still graze the land surrounding the fenced Russian Orchard and in the Call Orchard. The orchards still support productive fruit trees and the fruit is still harvested by visitors and local residents. The annual Harvest Festival also provides an opportunity to educate the public about the use of the landscape for fruit production.

Russian Era

The Russian-American Company grew fruit to supplement the local food supply. Company officials hoped to eventually produce fruit for the Russian population in Alaska. However, the orchard only produced enough fruit for the settlement. Russian-American Company employees had little knowledge of fruit production and experimented with fruit tree cuttings and seeds available from the Spanish missions. Although the Russians planted a sizable vineyard at the Chernykh Ranch, the small size of the original Fort Ross orchards in comparison to the larger areas land cultivated by the Russians reflects the limited status of fruit production.

The vast majority of fruit tree and vine planting stock grown at Fort Ross came from the California missions. Peach, grape, apple, pear, cherry, Bergamot pear, and quince were planted in the orchards. The only remaining Russian Era trees, the Capulin cherries, reflect the willingness of the Russian-American Company employees to experiment with growing unfamiliar fruit species. The Russian-American Company employees learned from the missions about fruit

production in California and the surviving trees reflect their attempts to replicate the success of mission orchards.

Ranch Era

Ranch families at Fort Ross grew fruit for both personal and commercial use. All of the owners of the property saw fruit production as a secondary endeavor to their larger operations of cattle ranching (Benitz), timber harvest (Fairfax and Dixon), dairy production (Call, before 1927), and sheep ranching (Call, after 1927). The Benitz family planted a large apple orchard for commercial use. The Call family planted a mixed-fruit orchard for personal use (Call Orchard), an orchard for both personal and commercial use (Sea View Orchard), and also planted fruit trees near their house. In addition, the Call and the Benitz families expanded the Russian Orchard. The Ranch Era fruit trees reflect the efforts of the ranch families to continue fruit production on the property.

VEGETATION

The fruit trees within Fort Ross State Historic Park are indicative of orchard practices from the period when they were planted. The most obvious clue to the trees' history is their age. In addition, the trees species, variety, and form reflect information about the historic context of the tree. Three types of cultivated fruit trees grown at Fort Ross are "seedling fruit trees," "standard-size variety fruit trees," and "semi-dwarf variety fruit trees."

Seedling Fruit Trees: Seedling fruit trees were grown before variety trees were available or when trees self-seeded in an orchard. Seedling trees are propagated from seed. Their fruit is often small and coarse and is not true to a variety. Seedling fruit was historically used as livestock feed, for making fermented beverages (e.g. cider, perry), and for baking and drying. Some fruit tree species are exceptional, however, and can occasionally produce edible fruit from seedling trees. Exceptions include olive, peach and fig species.

Standard-size Variety Fruit Trees: A standard-size variety fruit tree is grafted onto a seedling rootstock. Standard-size variety fruit trees were grown from the time variety trees were available in a region until the end of World War II. (In California, some varieties were available from the Spanish missions in the late 18th and early 19th-centuries, but many more varieties were available in commercial nurseries of new settlers from the 1850s, onwards.) The aerial portion of a standard-size variety fruit tree is known as the scion. The scion is a genetic clone of the cultivated variety. The rootstock is derived from a plant grown from seed. It's a unique individual, has no variety, and exists to provide a root system for the scion. (Generally, scions do not root well, but can form a graft union with a rootstock of another individual.) The seedling rootstock provides the trees with vigor and allows the tree to reach its full height (15-25 feet for apples, 30-40 feet for pears). Depending upon the species, the average life span of a full-size tree on a seedling rootstock varies from 80 to 150 years.

Semi-dwarf Variety Fruit Trees: A semi-dwarf variety fruit tree is a scion grafted onto a semi-dwarf rootstock. Dwarf and semi-dwarf fruit trees became prominent after World War II in commercial and residential orchards. The dwarfing rootstock reduces a tree's vigor and size. Semi-dwarf fruit trees grow from 10-15 feet tall. Dwarf fruit trees produce fruit more rapidly in their lives than standard-size fruit trees. They also produce higher quality fruit, and have become the industry standard for commercial orchards as they are easier to access for pruning, spraying and harvesting. The average life span of a semi-dwarf tree is 30 -50 years.

Russian Era Fruit Trees

The Russian-American Company planted seedling fruit trees and may have also planted variety fruit trees. The Spanish missions engaged in grafting and many varieties of fruit were available from the missions. The Russian Era grapevines, apple, pear, peach, Bergamot pear, and quince trees no longer grow at Fort Ross. The remaining Russian Era trees, the Capulin cherries, were likely planted from cuttings brought from the Santa Cruz Mission in 1820. The Capulin cherry is a domesticated tree that is native to Mexico

Figure 4.6: *(top, left) Russian Era tree form— tall trunk, unpruned, and full size.*

Figure 4.7: *(top, right) Ranch Era Standard-Size Variety Fruit Tree form— tall trunk, unpruned, and full size, 1927 (E.0. Essig, courtesy Bancroft Library).*

Figure 4.8: *(below) Contemporary Semi-dwarf Variety Fruit Tree form —small size with pruned open-bowl form and low trunk.*

and Guatemala. While the trees were potentially vegetatively propagated, they have characteristics of seedling trees, i.e., the parent tree was a seedling, not a variety. The 194-year old cherry trees are approximately 25 to 30 feet tall. The trunks are over four feet tall as a result of browsing within the orchard.

Ranch Era Fruit Trees

During the early Ranch Era, numerous varieties of fruit trees were propagated in California nurseries. Exemplifying this, Benitz planted 42 varieties of apples in his orchard. Fruit trees from the Ranch Era included standard-size variety fruit trees grafted onto seedling rootstock and seedling fruit trees. The apple and pear were grafted trees, the plum and prune trees may have originally been grafted trees but have self-seeded thus propagating more seedling trees, and the olive trees were planted from seed. The fruit trees were rarely pruned and reached their full size. Their lack of scaffold form and irregular inner branch patterns are reflective of a lack of pruning. The trunks of the apple and pear Ranch Era trees are tall, mostly as a result of animal browsing. The plum and olive trees have lower horizontal branches and were likely less appetizing to cattle, sheep, pigs, and deer that grazed in the orchards.

Contemporary Fruit Trees

The contemporary fruit trees include the two Rotchev House trees, and the trees planted by CDPR volunteers in the 1980s within the Russian Orchard and the Call Picnic Area. The trees at the Rotchev House were planted on semi-standard rootstock approximately 50 years ago (1960s). Although they were planted during the period of significance, the CDPR already owned the fort area and therefore the Rotchev House trees are not associated with the Russian or Ranch Eras and are non-contributing features.

The **semi-dwarf grafted trees** planted in the Russian Orchard are genetic clones of the historic Ranch Era varieties. After the trees were planted, volunteers pruned the trees into an open-bowl, modified central leader, or central leader form. The size and the form of the trees represent contemporary rather than historic fruit tree production

Table 4.2: Historic Fruit Tree Form

	Russian Orchard						Call Orchard				Benitz Orchard	Call House and Picnic Area	
Tree Form	Capulin cherry	Apple	Pear	Sweet cherry	Olive	Plum	Apple	Sweet cherry	Plum	Walnut	Apple	Apple	Plum
Variety Fruit Tree (Full-size, unpruned, tall trunk)		6	10				2				1	3	
Seedling Fruit Tree (Full-size, unpruned, tall trunk)	3			18 (possible variety trees)				2		1			
Seedling Fruit Tree (Full-size, unpruned, medium or multi-stemmed trunk)					4	4			13				9

methods and in this regard the trees are incompatible with the historic character of the orchard. The trees will reach no more than 15 feet tall, much less than the historic variety trees on seedling rootstock. The open-bowl and central leader shapes do not reflect the Ranch Era trees which were unshaped as a result of little pruning. Despite this, the contemporary trees do preserve the genetic material in the orchard. Some of the parent trees from which the young trees were grafted have already died and thus the propagation of the younger trees has successfully preserved the historic varieties within the landscape. In conclusion, the contemporary trees are non-contributing features to the orchard. They have compatible genetic material, but an incompatible form.

NATURAL SYSTEMS AND FEATURES

The natural systems and features of the surrounding environment influenced the placement and the productivity of the orchard. The Russians were originally impressed by the California climate, which was significantly more suitable for food production than Alaska's. However, the Marine West Coast climate at Fort Ross also offered challenges to the novice farmers. The climate is characterized by wet mild winters, dry summers, and a heavy fog belt along the coast. The fog and cool summer temperatures negatively impacted crop yields. Likely for this reason, the Russians planted the orchard about a half mile north of the fort on a south facing slope just over 400 feet above sea level. At this elevation, the fog's influence was somewhat reduced.

Fort Ross is located in the range of the Coast redwoods. The habitat in the vicinity of the fort is a mix of coastal prairie/grassland and Coast redwood/Douglas fir forest. Both the Russians and the Ranch families logged the forests in the hills behind Fort Ross. In 1839, Laplace described the landscape as a "well-kept park" indicating a mixture of fields and forest around the orchard (Farris 2012, 249). The forest directly adjacent to the orchard was logged in the late 1880s. Since the property was acquired by CDPR, vegetation density has increased between the fort and the Russian Orchard and in the vicinity of the Benitz Orchard due to

Figure 4.9: *Road cut near Fort Ross offset by the 1906 earthquake. The San Andreas Fault runs across photograph (Fort Ross Conservancy Library).*

a reduction of grazing and prohibition of timber harvest. The visual connection between the fort and the orchard has been reduced as a result of natural reforestation.

As mentioned earlier, the San Andreas Fault passes directly through the Russian Orchard. It runs from the southeast corner of the orchard to the redwood tree at the north of the orchard. The 1906 earthquake altered both the topography and the hydrology of the orchard landscape. The earthquake likely increased the slope of the hill running through the orchard to the south of the fault. In addition, the earthquake created sag ponds by causing the ground to subside and altering the drainage. Sag ponds are located at the southeast corner of the orchard, in the heavily vegetated central portion of the orchard, and to the north of the orchard. A spring runs outside the fence to the north of the sag pond at the southeast corner of the orchard. The earthquake could have exposed the spring or altered its flow.

ARCHAEOLOGICAL SITES

The direct vicinity of Fort Ross was occupied by indigenous people six to eight thousand years ago. Archaeological sites in Fort Ross State Historic Park represent Pre-Contact to Ranch Era time periods. Several archaeological sites have been located near the Russian Orchard and it is likely that future investigations could reveal additional remains (Lightfoot, Wake, and Schiff 1991).

In 1984, Glenn Farris, Breck Parkman, and a CDPR field crew excavated an archaeological site near the orchard (CA-SON-1446H). They found complete Russian bricks, brick fragments, iron spikes, nails, earthenware ceramic sherds, and three glass beads. Farris and Parkman concluded that the items discovered were likely the remnants of the orchard house described in the 1841 inventories and specifically the orchard house kitchen oven was likely the source of the bricks.

Three other archaeological sites have been located near the orchard. Two deposits (CA-SON-1895/H and CA-SON-1896) near the Russian Orchard represent Kashaya Pomo households. CA-SON-1895/H likely dates from the Pre-Contact period to the Russian Era. CA-SON-1896 dates from the Russian and/or early Ranch Eras. The two encampments could have housed California Native American Indians who worked in the orchard. In addition to the middens, a lithic scatter (CA-SON-1894) dating from pre-contact to the Russian Era is located on the south side of the Fort Ross Road.

The archaeological sites contribute to the historic significance of the orchard. The brick remnants represent the only known remains of the orchard house. The Kashaya Pomo archaeological sites signify the use of indigenous labor in the orchard and the distribution of housing sites around the stockade compound. Future investigation could determine how the Kashaya sites relate to the orchard. In addition, investigation could attempt to locate additional remnants of the orchard house and the location of the orchard fence.

SMALL SCALE FEATURES

The primary small scale feature in the historic eras in the orchard was a wooden fence. The Russian-American Company built an enclosure around the orchard that was described as a post fence, a wooden palisade, and a durable wooden fence. The fence was at least partially installed by 1822. By 1880 in the Ranch Era, the fence was described as being eight feet high and made of two-inch thick redwood slab posts that were spaced at ten foot intervals and connected by girders (Munro-Fraser 1880, 370). The tall fence could have either been a Russian Era fence or may have been constructed during the Ranch Era. By 1933, the redwood fence had been replaced by several picket fences surrounding areas of the orchard. Photographs from the 1920s depict a rough picket fence connected by wire. A photograph from 1942 depicts a picket enclosure in the center of the orchard possibly used for sheep. A similar enclosure was constructed in the Call Orchard. The current orchard enclosure was established in the 1980s, and was replaced in 2012.

Only a few boards remain from the Ranch Era fence. The current fence protects the historic trees from damage by grazing cattle and feral pigs. The fence is made from contemporary materials and may not follow the historic orchard boundary. While the fence materials do not represent historic fencing practices, the pattern of having a fence around the orchard is compatible with the historic character.

SUMMARY

The five orchard areas possess different levels of historic integrity. The Call House and Picnic Area fruit tree areas lack integrity because nearby vegetation is encroaching on the fruit trees. In addition, the removal of the Turk House has compromised the site's setting. However, the majority of fruit trees in this area have an unpruned full-size form consistent with their origin in the Ranch Era. The Benitz Orchard lacks integrity as only one of the original 1700 trees remains and the adjacent forest is encroaching into the field where the orchard was once located. The

Figure 4.10: *Fence enclosure in the center of the Russian Orchard, 1942 (Frank Adams, courtesy Bancroft Library).*

Figure 4.11: *Ranch Era fence, 1927 (E.0. Essig , courtesy Bancroft Library).*

Rotchev House fruit trees lack integrity because they are not associated with a significant historic period. The Call Orchard retains integrity of spatial organization, land use, vegetation and natural systems and features. The orchard setting has not been altered and the pattern of forest and field directly adjacent to the orchard has been maintained through grazing. In addition, all of the trees in the orchard date from the historic Ranch Era.

The Russian Orchard retains integrity of spatial organization, land use, vegetation and natural systems and features. Forty-three historic trees of several different species and varieties continue to grow in the orchard. Changes have occurred since the Russian-American Company left and the Call family departed, however, that have compromised some integrity. The largest compromises to the historic integrity of the Russian Orchard are the following:

- Loss of tree species and varieties since the Russian Era and the Ranch Era;
- Alteration of the landscape's topography due to seismic activity since the Russian Era;
- Reforestation within the viewshed between the Russian Orchard and the fort, and in the area outside the orchard fence;
- Replacement of the pedestrian pathways connecting the Russian Orchard to the fort with a paved road;
- Contemporary introduction of incompatible fruit trees due to:
    1. Uncharacteristic tree type (semi-dwarf rootstocks rather than seedling rootstocks);
    2. Uncharacteristic tree form (open-bowl or modified open-bowl, rather than unpruned scaffold);
    3. Uncharacteristic arrangement (a regular, rather than an irregular tree spacing).

The treatment section (Chapter 7) provides recommendations to address some of the site alterations and thereby enhance the historic character of the landscape.

CHAPTER 5

STABILIZATION

INTRODUCTION

This chapter addresses stabilization of the orchard areas and fruit trees of Fort Ross State Historic Park and should be used to prioritize immediate stabilization efforts to prevent further loss of cultural resources. Stabilization of orchard trees is described as those efforts of a physical, mechanical or horticultural nature intended to arrest the rate of decline of a tree or an orchard space until long-term preservation maintenance actions can be performed. Stabilization is not intended to be a long-term strategy for historic orchard management: it is the prelude to future preservation maintenance actions.

Scope of Stabilization

The goal of orchard tree stabilization is to reduce or eliminate health stressors on fruit trees through specific, targeted actions for individual trees as well as the orchard space as a whole. Stressors may be microscopic such as fungi, or macroscopic as in deer or other large fauna. Stressors may also come from outside the orchard space: encroaching forest trees or broad drainage patterns, for example. Not all stressors are immediately reversible, however a stable orchard condition is achieved when immediate threats to trees within a historic orchard are addressed and mitigated to the greatest degree possible. The process of stabilization will provide trees with the best cultural conditions possible so that their longevity is maximized.

Stabilization is intentionally limited in scope to only immediate and correctable tree health stressors and should not include substantive changes to the overall character of an

orchard if those changes are not directly related to correcting past deficiencies or improving existing growing conditions. Stabilization actions should not damage, eliminate or alter the integrity of cultural resources within the orchard, nor negatively impact natural resources unless it is determined that the importance of the fruit tree resources is greater than the competing natural resources.

Fruit Tree Assessment

Assessing the current physical state of a fruit tree and its surroundings is the first step in orchard stabilization. Understanding the current physical and environmental conditions of each tree enables managers to prioritize interventions and focus stabilization efforts on the most at-risk or valuable trees first.

The *Fruit Tree Condition Assessment Field Form* developed by the NPS (Appendix II), provides a comprehensive analysis of tree conditions within the orchard and enumerates specific tree health stressors by category and zone. During an April 2014 visit the Fort Ross orchard project team completed a comprehensive assessment of all extant fruit trees in all orchard areas using this form. Baseline data were collected (Appendix VII) as well as photographs of all documented fruit trees. This information is utilized throughout this chapter to establish the existing condition and health stressors of fruit trees at Fort Ross.

HEALTH STRESSORS IN THE ORCHARD AREAS: THREATS TO THE LONGEVITY OF FRUIT TREES

Understanding the range of stressors that threaten the fruit trees at Fort Ross enables orchard managers to prioritize stabilization actions. Stressors may be biotic, abiotic, environmental, structural or cultural in nature. The sum total of stressors are a manifestation of local orchard growing conditions as well as each orchard's unique cultural history.

The major orchard tree stressors at Fort Ross are encroaching vegetation; structurally unsound limbs and trunks; pest, disease, and wildlife damage; disease reservoirs; root suckers and watersprout competition; soil moisture competition; insufficient supplemental irrigation;

nutrient deficiency, and overall soil health. Each of these stressors are described as follows:

1) Encroaching Vegetation

A major issue in some orchard areas is the encroachment of vegetation. Encroaching vegetation has the most significant impact in the Russian Orchard adjacent to the redwood forest and cathedrals and around the Picnic Area fruit trees (Table 5.1). Vegetation encroachment is occurring on the ground, within the fruit tree canopy drip-line, and above the canopy. Encroaching vegetation is competing with the fruit trees for water, nutrients and light. Stable fruit trees have no encroaching vegetation within the orchard space occupied by the fruit tree, including within the drip-line of the canopy, and around and above the canopy.

Recommendations:

Keep the orchard floor and airspace above the fruit trees free of overgrown groundcovers, shrubs, and trees. Remove over-shading branches of larger non-contributing trees.

Figure 5.1: *Benitz apple tree G-MdR-1 (center) surrounded by encroaching native trees.*

Table 5.1: Vegetation Encroachment by Orchard Area

Orchard Area	Type of Encroaching Vegetation
Russian Orchard	Redwood trees; Coyote brush; blackberry; poison oak; annual & perennial grasses; plum suckers & seedlings; olive tree seedlings; overgrown adjacent fruit trees
Call Orchard	Redwood trees
Benitz Orchard	Douglas fir trees; annual & perennial grasses
Call House & Picnic Area	Eucalyptus trees; Monterey cypress trees; periwinkle; blackberry
Rotchev House	No encroachment

Table 5.2: Structural Problems by Orchard Area to Stabilize or Monitor

Orchard Area	Tree Type	Structural Problems
Russian Orchard	Apple	Basal and trunk cavities, splits and cracks in trunk, leaning trunk, hollow trunk, horizontal trunk, unbalanced scaffolds/canopy.
	Pear	Basal and trunk cavities, splits and cracks in trunk, leaning trunk, horizontal trunk, unbalanced scaffold/canopy.
	Plum	Trunk cavities, splits and cracks in trunk, leaning trunk, tree falling, unbalanced scaffolds/canopy.
	Capulin Cherry	Basal and trunk cavities, splits and cracks in trunk, leaning trunk, unbalanced scaffolds/canopy.
	Olive	Trunk cavities, splits and cracks in trunk, unbalanced canopy.
	Sweet Cherry	Trunk cavities, splits and cracks in trunk, leaning trunk, tree falling, unbalanced scaffold/canopy.
Call Orchard	Plum	Trunk cavities, splits and cracks in trunk, leaning trunk, unbalanced scaffolds.
	Sweet Cherry	Trunk cavities, splits and cracks in trunk, leaning trunk, unbalanced scaffolds.
	Walnut	Trunk cavities, splits and cracks in trunk, leaning trunk, unbalanced scaffolds.
	Apple	Trunk cavities, splits and cracks in trunk, leaning trunk, unbalanced scaffolds.
Benitz Orchard	Apple	Splits and cracks in trunk, unbalanced scaffold.
Call House & Picnic Area	Plum	Splits and cracks in trunk, unbalanced scaffolds, leaning trunk, fruiting bodies on trunk.
	Apple	Trunk cavities, splits and cracks in trunk, leaning trunk, unbalanced scaffolds.
Rotchev House	Apple	No deficiencies

2) Structurally Unsound Limbs and Trunks

Many Russian and Ranch Era fruit trees possess structural defects such as unsound limbs or hollow trunks. Broken, damaged, unbalanced or weakly attached tree limbs can break off, causing damage to healthy limbs in the process. They can also damage the tree trunk by tearing away bark and healthy cambium tissue. A number of older trees possess trunks with major cavities that would ordinarily call for removal of the tree (Table 5.2).

Recommendations:

Carefully remove unsound limbs to alleviate risks and improve the appearance of the tree. Prop and brace trunks with cavities and prune the tree canopy to lighten the load supported by unsound trunks. Thin canopy growth to alleviate the wind-sail effect. The wind-sail effect results when a thick tree canopy catches heavy wind and causes the tree to twist and sway, resulting in stress on the trunk. Thinning creates a more porous canopy that will allow the wind to pass through the tree. See Chapter 5 - Stabilization Techniques for more information.

Figure 5.2: *Apple tree D-MdR-13 with trunk cavity.*

Figure 5.3: *(right) Sapsucker damage to bark of apple B-MdR-4*

Figure 5.4: *(left) Wild pigs in the Russian Orchard.*

3) Pests, Diseases and Wildlife Damage

The fruit trees at Fort Ross are threatened by a host of animals, organisms and pathogens that have the capacity to induce stress on a tree by forcing it to redirect its energy towards defense or wound closure instead of growth or fruit production (Table 5.3). Some organisms mainly damage fruit but leave the tree unscathed and such pests should be dealt with only after any threats to the life of the tree have been mitigated. The first priority of stabilization is the health and longevity of the tree itself, not fruit quality or yield.

Lichens are present in many fruit tree canopies and trunks and may be removed at any time of the year. Though no scientific connection to tree decline has been attributed to their presence in tree canopies, observation suggests that lichen reduces the photosynthetic capacity of the foliage through shading, and should be removed to the greatest extent possible.

Recommendations:

Protect trees from pests through physical, mechanical or chemical treatment to stabilize and improve the overall tree health, before addressing pests that affect fruit quality.

Table 5.3: Pests, Diseases and Wildlife Damage Present by Orchard Area

Orchard Area	Pests, Diseases and Wildlife Damage
Russian Orchard	Fire blight (some apples and pears) Canker (D-PcC-25) Eutypia on Capulin cherries Fungal fruiting bodies Termites & white rot (Gravenstein B-MdR-4) Pear slug & California pear sawfly larva Pack rat nest in olive (D-OeR-15) Gophers & voles Woodpeckers Lichen
Call Orchard	Fire blight Canker Eutypia Woodpeckers Lichen
Benitz Orchard	Woodpeckers Lichen
Call House & Picnic Area	Woodpeckers Lichen
Rotchev House	Lichen

Table 5.4: Disease Reservoirs Present by Orchard Area

Orchard Area	Disease Reservoirs
Russian Orchard	Fire blighted tree limbs/shoots Cankers on limbs Fungal fruiting bodies on trunk (B-MdR-4)
Call Orchard	Fire blighted tree limbs/shoots Eutypia on shoots
Benitz Orchard	Diseases on apple tree limbs (unspecified)
Call House & Picnic Area	None observed
Rotchev House	None observed

Figure 5.5: *(left) Fallen fruit harbor insect larva and fungal inoculum.*

Figure 5.6: *(right) Diseased branch.*

4) Disease Reservoirs

Disease reservoirs are found in three of the five Fort Ross orchard areas (Table 5.4). Harmful fungi and insects can harbor in dead wood in the tree or overwinter within accumulated woody debris and fallen fruit on the orchard floor. Removing these reservoirs of disease can greatly reduce the incidence and recurrence of diseases on fruit trees.

Recommendations:

Sanitize the orchard to reduce the volume of inoculant and break the cycle of reinfection. Remove dead and diseased wood from the fruit trees, and remove fallen fruit and debris from the orchard floor. Dispose of diseased wood. Do not use diseased wood to create mulch or compost for the fruit trees. Burn diseased material if removal from site is not practical.

Figure 5.7: *English walnut tree trunk (center) overwhelmed by adjacent mature Black walnut suckers.*

5) Root Sucker and Watersprout Competition

Root suckers are vigorous shoots that grow from the fruit tree's roots or from the base of the trunk beneath the graft union of a propagated fruit tree and draw energy and nutrients away from the tree canopy. Some root suckering is normal, especially on grafted fruit trees, and can be easily pruned off when the suckers are still young and pliable. Such vegetation should be removed as soon as possible with pruners or loppers.

The majority of Ranch and Contemporary Era fruit trees at Fort Ross are grafted. Some rootstock types sucker more than others and may require more frequent sucker removal. Fruit trees that are accessible to cows or deer such as the Call, Benitz and Picnic area trees may actually benefit by having their suckers removed by grazing.

Watersprouts can emerge from any part of the tree that is above the graft union and are therefore genetically identical to the scion. Watersprouts are the tree's natural method of

Figure 5.8: *(left) Apple tree suckers before removal.*

Figure 5.9: *(right) Apple tree suckers after removal. (Note the one remaining watersprout on trunk, selected for branch replacement. The pruned debris is removed from the orchard for sanitation.)*

filling out the canopy to increase photosynthetic capability, however too many watersprouts crowd the interior, causing less light and air to penetrate the canopy, reducing vigor and potentially causing disease. Watersprouts can also damage desired limbs by crossing, rubbing and chafing the bark. The resulting wounds require further diversion of energy to enclose.

Watersprouting is common among the younger Contemporary Era trees in the Fort Ross orchards and to some degree on the Ranch Era trees (Table 5.5). Some tree species that are not normally single-trunked, such as the seedling olive trees in the Russian Orchard, produce both suckers and watersprouts from the base. This, however, does not necessarily indicate a health issue.

Watersprouts are not as deleterious to tree health as root suckers, but they must still be managed to create a stable tree with minimal health stressors. A watersprout may sometimes be utilized to the tree's advantage by training it to replace a missing branch, or to take the place of a dead, diseased or damaged branch once it is removed.

Figure 5.10:
Watersprouts being removed from the trunk of pear tree C-PcC-1.

Recommendations:

Remove suckers that arise from below the graft union on grafted fruit trees, i.e., from rootstocks that are genetically different from the scion (fruit-producing) portion of the tree.

Monitor watersprouts through the growing season and remove those not providing a benefit to the tree. Remove potentially rubbing or crossing watersprouts or select one for branch replacement. Young watersprouts can be easily removed by simply bending them downward and "rubbing" them off cleanly.

Table 5.5: Presence of Root Suckers and Watersprouts by Orchard Area

Orchard Area	Root Suckers and Watersprouts
Russian Orchard	Suckers and watersprouts on Ranch and Contemporary Era trees
Call Orchard	Suckers and watersprouts on many trees
Benitz Orchard	Mild suckering on remaining tree
Call House & Picnic Area	Suckers and watersprouts on many trees
Rotchev House	Suckers present on both trees, mild watersprouts

6) Soil Moisture Competition

Currently, the soil moisture within the orchard areas of Fort Ross is shared between desired and non-desired vegetation, specifically between fruit trees (desired) and grasses, shrubs and other encroaching trees that compete with the fruit trees. All plant roots compete for soil moisture and this competition can places stress on the fruit trees, particularly if they are very young or very old. Optimal health of the desired vegetation can only occur if adequate soil moisture is available.

The deeply rooted perennial grasses and abundant annual grasses found in the Russian and Benitz orchards are strong competitors for soil moisture, as are shrubs within the drip line of some fruit trees (Table 5.6). Coast redwood trees produce shallow and very dense root systems and are extremely strong competitors for soil moisture, as are the Eucalyptus trees near the Call House and Picnic Area. Both species are capable of desiccating soils during the dry seasons and thereby drought-stressing fruit trees.

Recommendations:

Mow the orchard floor to reduce competing vegetation. Remove undesired vegetation. Maintain groundcovers that will not compete excessively with fruit trees for soil moisture. Remove, reduce or root-prune non-contributing nearby trees. If necessary, compensate for soil moisture deficits between competing plants by irrigating the orchard.

Table 5.6: Soil Moisture Competitive Vegetation by Orchard Area

Orchard Area	Soil Moisture Competitors
Russian Orchard	Grasses, shrubs and redwood trees, undesired fruit tree seedlings and suckers
Call Orchard	Grasses, some shrubs at northern edge
Benitz Orchard	Dense grasses
Call House & Picnic Area	Eucalyptus and Monterey cypress trees, periwinkle and blackberry
Rotchev House	Minor turf grass growth, otherwise no nearby competition

7) Insufficient Supplemental Irrigation

Sudden or drastic changes to a fruit tree's normal irrigation budget may stress the tree to the point of failure if watering is not resumed. Fruit trees that are regularly irrigated will grow roots wherever water is available. If irrigation frequency, quantity, or pattern of distribution is suddenly altered for long periods, the tree must adapt by sending roots deeper or further out. This takes energy that may prove insurmountable for old or weakened trees.

The majority of fruit trees in the Fort Ross orchard areas are well established and do not require supplemental irrigation, except during prolonged periods of drought. All new fruit tree plantings must be adequately and regularly watered for a period of three years to become fully established (Table 5.7). Newly planted trees do not need large quantities of water, but they do need regular water to compensate for lack of established roots.

Recommendations:

Supply fruit trees with adequate supplemental irrigation during initial planting and during dry months to alleviate drought stress and improve tree health. Provide 1" depth of irrigation per week per fruit tree. The Fort Ross soils are sandy loam and are therefore freely draining. In the first month, new trees should be watered with several gallons daily. Later, new trees should be watered twice weekly until the rainy season arrives. Occasional deep watering is recommended for young trees to encourage deep rooting down to the water table. Once deep roots are established regular watering of young trees is not necessary.

Table 5.7: Recommended Supplemental Irrigation by Orchard Area

Orchard Area	Supplemental Irrigation
Russian Orchard	Contemporary trees & any new tree plantings
Call Orchard	Any new tree plantings
Benitz Orchard	Not necessary for existing tree
Call House & Picnic Area	Contemporary trees and young apple trees
Rotchev House	Apple trees may benefit from occasional deep watering

8) Nutrient Deficiency

Each fruit tree needs sufficient nutrition in the form of macronutrients Nitrogen, Phosphorous and Potassium as well as a range of micronutrients to carry out its annual life cycle. A deficiency in any macro- or micronutrient will reduce the health and vigor of the tree and potentially hasten its demise. See Chapter 6 – Fertilizing for further information on the tools and techniques for correcting tree nutrient deficiencies.

Soil testing and analysis by a professional laboratory is an important part of orchard stabilization and enables managers to take corrective action if necessary. Soil testing labs recommend specific actions to rectify nutrient deficiencies. Soil samples were collected in July, 2014 at four locations within the study area: three within the Russian Orchard and one at the Call Orchard. Perry Laboratory Horticultural Advising and Testing in Watsonville, CA analyzed the soil samples (see Appendix IV).

Soil test results show similar conditions for the four sample sites:

- Lower than optimal levels of Nitrogen, Phosphorous and Sulfate
- Higher than optimal levels of Magnesium, Manganese and Iron

Figure 5.11: *Adequate available nutrients support healthy green foliage (as shown) and overall tree health.*

The soil report recommends the following additions for all areas:

- Nitrogen at 2 lbs. of actual Nitrogen / 1000 sq. ft. in spring
- Phosphorous at 1 lb. of Phosphate / 1000 sq. ft. in spring
- 6-24-24 complete fertilizer at 20 lbs. / 1000 sq. ft. in autumn
- Oyster shell lime (Calcium carbonate) at 25 lbs. / 1000 sq. ft. in autumn to increase pH towards the optimum range. Three to five years of annual lime applications are necessary. Lime is immobile in the soil and must be incorporated using an aerator or tiller.

With the exception of oyster shell lime, the soil report recommends only synthetic/non-organic fertilizers to correct nutrient deficiencies in the Fort Ross soils. Despite this, it is highly recommended that organic fertilizers be used instead of synthetic fertilizers. Organic fertilizers are derived from plant or animal parts such as manure, guano, bone and blood meal, fish emulsion, compost or compost tea. Organic fertilizers are preferable to synthetic fertilizers as they:

- Contain organic matter which improves soil structure and moisture retention,
- Contribute nutrients and microorganisms to soil for improved soil health on a slow, sustained basis,
- Contain more micronutrients than synthetic fertilizers,
- Are less likely than synthetic fertilizers to burn sensitive plant roots if over-applied,
- Do not leach out of soils as readily as synthetic fertilizers do (an important consideration in the well-drained soils of Fort Ross).

Choosing to use organic fertilizer versus synthetic is the difference between building overall soil health versus

providing a 'quick fix' to treat nutrient deficiencies. Synthetic fertilizers work well to solve plant health issues for the near term, but they do not address plant-soil relationships holistically and do little to nourish the soil food web.

Organic fertilizers generally provide lower macronutrient analysis (amounts of Nitrogen, Phosphorous and Potassium) per volume so it is often necessary to add significantly greater quantities compared to more concentrated synthetic fertilizer. Organic Nitrogen (N) sources include fish meal, emulsion or powder, or cottonseed meal. Organic Phosphorous (P) is obtained from bat guano or bone meal. Sulfur is available as gypsum (Calcium sulfate).

Recommendations:

Fertilize at the proper rate and time of year for optimal uptake. Unintended damage may occur if fertilizer is applied at the wrong time of year, e.g., applying too much soluble Nitrogen in the autumn stimulates new growth that cannot harden off in time for winter dormancy and thus is susceptible to frost damage.

Organic Fertilizer Application Rates:

- Fish meal for Nitrogen (N) = 22 pounds meal per 1000 sq. ft. (spring application)
- Cottonseed meal for Nitrogen (N) = 40 pounds meal per 1000 sq. ft. (spring application)
- Bone meal for Phosphorous (P) = 33 pounds meal per 1000 sq. ft. (spring application)
- Guano for Phosphorous (P) = 10 pounds guano per 1000 sq. ft. (spring application)
- Oyster shell lime (Calcium carbonate) at 25 lbs. / 1000 sq. ft. (autumn application)
- Gypsum (Calcium sulfate) at 11 pounds gypsum per 1000 sq. ft. (any time of year)

Synthetic Fertilizer Application Rates:

- Nitrogen (N) at 2 lbs. of actual Nitrogen / 1000 sq. ft.

(spring application)

- Phosphorous (P) at 1 lb. of phosphate / 1000 sq. ft. (spring application)
- NPK 6-24-24 (complete fertilizer) at 20 lbs. / 1000 sq. ft. (autumn application)
- Oyster shell lime (Calcium carbonate) at 25 lbs. / 1000 sq. ft. (autumn application). Incorporate into soil by aerating or tilling in.

Table 5.8:
Recommended Nutrient Application by Orchard Area to Correct Deficiencies

Orchard Area	Nutrient Application to Correct Deficiency
Russian Orchard	• Apply Nitrogen (N) at 2 lbs. of actual nitrogen / 1000 sq. ft. in spring. • Apply Phosphorous (P) at 1 lb. of phosphate / 1000 sq. ft. in spring. • Apply 6-24-24 (complete fertilizer) at 20 lbs. / 1000 sq. ft. in autumn. • Apply oyster shell lime (Calcium carbonate) at 25 lbs. / 1000 sq. ft. in autumn; incorporate into soil by aerating or tilling.
Call Orchard	• Apply nitrogen (N) at 2 lbs. of actual nitrogen / 1000 sq. ft. in spring. • Apply Phosphorous (P) at 1 lb. of phosphate / 1000 sq. ft. in spring. • Apply 6-24-24 (complete fertilizer) at 20 lbs. / 1000 sq. ft. in autumn. • Apply oyster shell lime (Calcium carbonate) at 25 lbs. / 1000 sq. ft. in autumn; incorporate into soil by aerating or tilling.
Benitz Orchard	No known nutrient deficiencies
Call House & Picnic Area	No known nutrient deficiencies
Rotchev House	No known nutrient deficiencies

9) Soil Health

Adequate fertilization with organically derived nutrients is important for maintaining tree health, but no amount will benefit the tree if the rhizosphere (the biologically active zone around plant roots) is unhealthy and unstable. The rhizosphere is the zone where tree roots most actively seek moisture and nutrients, respire and associate with symbiotic fungi like mycorrhizae. This is a highly active zone where microorganisms and fungi break down organic matter and make nutrients available to plants. A tree can only thrive if its roots are healthy and if the conditions are right for it to uptake water and nutrients.

The biotic soil food web of the rhizosphere is complex: factors such as pH, soil structure, soil compaction, organic matter, drainage, and the trillions upon trillions of living organisms that dwell in the soil all play a part in enabling a tree to perform its best below and above ground.

There are many ways to begin stabilizing orchard floor soils. The following actions can be implemented immediately, but some will take time to yield benefits:

- Not tilling the soil, only mowing grasses seasonally
- Adding organic matter in the form of compost
- Fertilizing and amending soils as necessary
- Mulching to retain soil moisture
- Draining heavy or soggy soils
- Aerating soils to promote air, water and nutrient penetration

Aerating orchard soil is one stabilization action that can yield benefits very quickly (within a season or two), especially when soils have been compacted by repeated vehicle or foot traffic, or by standing water. Aeration improves orchard soil by breaking up and loosening compacted layers and thus allowing water, oxygen and nutrients to cycle more effectively below the soil surface (see Chapter 6 – Aerating for a more thorough discussion of the benefits of aeration.

The soils in the Russian Orchard will benefit from aerating around the fruit trees especially along and near the main entrance path from the gate to the picnic area. The Call House and Picnic Area Orchard and the fruit trees at the Rotchev House will also benefit from aeration of compacted soils within the root zones. The Call and Benitz orchards may be impractical to aerate due to lack of access by a tractor or walk-behind aerator.

Good soil moisture drainage is important for tree roots to prevent stagnation or anaerobic conditions within the root zone. Within the Fort Ross orchards the terrain provides adequate drainage generally, with the exception of some location within the Russian Orchard (see Map 3.2 Russian Orchard Topography for locations with standing water or poor drainage). Draining these areas may not be feasible so it is recommended that they be avoided when establishing new tree plantings.

Recommendations:

Mow orchard floor vegetation seasonally but do not till the orchard floor: tilling disturbs the fragile rhizosphere ecosystem and excessive tilling can destroy soil structure. Aerate orchard areas every two to three years to improve soil texture, reduce compaction and increase microbiological activity within the rhizosphere. Apply mulch and compost to increase the organic material in the soil and support the soil biology (see Table 5.9). Avoid using chemicals in the orchard that will damage the soil biology.

Table 5.9: Actions for Soil Health by Orchard Area

Orchard Area	Action for Soil Health
Russian Orchard	• Aerate around fruit tree canopies ever 2-3 years • Aerate entire orchard floor every 4-5 years • Amend with compost under drip line of trees • Apply wood chip mulch under fruit tree canopies every 1-2 years • Fertilize according to soil report recommendations
Call Orchard	• Aeration may not be practical in this orchard • Apply wood chip mulch under fruit tree canopies every 1-2 years • Fertilize according to soil report recommendations
Benitz Orchard	• Soil improvement actions may not be practical in this orchard
Call House & Picnic Area	• Remove groundcover and debris around Picnic Area trees • Aerate around trees to alleviate compaction from traffic • Amend with compost under drip line of trees • Apply wood chip mulch under fruit tree canopies every 1-2 years
Rotchev House	• Aerate where possible to alleviate compaction from foot traffic • Apply mulch layer to mitigate compaction and improve soil structure • Amend with compost under drip line of trees

Figure 5.12: *Stabilized pear trees after several years of preservation maintenance work (Filoli Orchard).*

STABILIZATION TECHNIQUES

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

Pruning to Stabilize

Pruning is the conscious and methodical removal of material from a tree and is among the most tactile and intimate of orchard practices. There are few better ways to become familiar with historic fruit trees than to spend hours considering how each pruning action will affect the shape and health of a tree. For this reason, using the correct pruning techniques is critical. Historic trees in the Fort Ross orchard areas should be pruned to retain the historic character of the tree rather than to create a style of tree that is aesthetically pleasing by contemporary standards. Contemporary trees should be pruned to an open bowl style that does not encroach upon neighboring trees.

Figure 5.13: *Pruning watersprouts on contemporary pear tree in the Russian Orchard.*

Pruning has a stimulating effect on trees by altering the chemistry and flow of nutrients within the tree canopy. This often leads to increased new growth and the subsequent need to prune year after year. Removing tissue other than dead, diseased or damaged wood will typically result in the production of new growth, even with old trees that have reached their mature height. One rule of thumb states: "The more you prune, the more you will need to prune."

Too much pruning at one time will either send the tree into decline or shock it into producing a flush of new growth that must be pruned out. Consider that mature, neglected fruit trees have essentially balanced themselves in terms of energy expenditure after reaching their mature size. Altering a mature tree's canopy causes a biochemical response that often results in new growth. Stabilization pruning cuts must be prioritized and done gradually, especially on old or senescent trees, to avoid hastening the decline of the tree. *Never remove more than 25% of a fruit tree's live canopy in one year. Anticipate taking three to four years to fully clean or stabilize a large tree by pruning.*

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

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

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

Damaged wood such as cracked, split or abraded limbs and twigs are of limited value to the tree even if they still produce leaves and fruit. It is better to remove a damaged limb and retrain a watersprout or shoot from an adjacent limb into its place. Damaged wood should be removed sooner rather than later but is best removed during the dormant season, when the tree is less likely to respond with a flush of new growth.

Figure 5.14: *(left) Pruning out fire-blight diseased wood in a pear tree.*

Figure 5.15: *(right) Sterilizing tools in between cuts.*

Structural Pruning

Pruning for structure means consciously retaining or removing branches and stems to achieve a specific tree shape or form and is employed during and after stabilization to improve fruit tree health. It is best performed by someone experienced in training fruit trees and preferably during the winter dormant season (see Chapter 6 – Pruning, for an expanded description of fruit tree pruning techniques).

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

Figure 5.16: *A 100-year-old apple tree in need of stabilization by structural pruning.*

Branches that cross near to each other but do not touch are likely to become rubbing branches in time, so it is advisable to select one to remove now rather than later. Neglected fruit trees often create long branches that originate on one side of the tree and grow through the center to the other side of the canopy resulting in an "umbrella" or "muffin top" form. This dense, intertwined growth inhibits air and light penetration through the canopy, as evidenced in the previous photo (Figure 5.16).

Selectively remove crossing branches where they originate or cut them back to a side branch that has a better orientation (i.e. growing outwards from the center or towards an open spot in the canopy). Crossing branch removal will eventually restore the openness of the canopy but must be done gradually, over the course of three to four years. This must not be done all at one time to avoid harming the fruit tree. As with all structural pruning, the removal of rubbing or crossing branches should be done during the dormant season.

Thinning the interior of a fruit tree canopy improves the canopy structure and serves to increase the amount of light and air that reaches the interior scaffold limbs, which in turn provides a drier and less disease-prone environment and assists fruit ripening. Do not over-thin the foliage as doing so may only stimulate more watersprouts, as mentioned previously. Heavy thinning should be done during the dormant season but light thinning may occur at any time of year. Another common structural pruning practice is to enlist watersprouts to become new limbs or scaffold branches by training them over time.

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

Occasionally it may be necessary to stabilize a fruit tree limb that is overextended by pruning it back considerably. Doing

this usually takes end weight off the limb and reduces the chance that the limb will break off and cause further damage to the tree's trunk. Making large cuts mid-branch is called a heading cut and is acceptable when called for.

Mechanical Stabilization

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

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

With larger limbs, more robust lumber must be used, such as with the 6" x 6" timber prop for the Capulin cherry tree *D-PsP-1*.

Figure 5.17: *(left) Apple tree limb (D-MdR-13) supported by 2" x 4" lumber prop.*

Figure 5.18: *(right) Capulin cherry (D-PsP-1) tree limb supported by heavy-duty 6" x 6" timber prop.*

Figure 5.19: *(left) Bracing bolts, rods and hardware (University of Florida, Institute of Food and Agricultural Sciences, http://hort.ifas.ufl.edu/woody/cabling.shtml).*

Figure 5.20: *(right) Bracing bolt detail.*

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

A brace is a solid metal threaded rod used to connect two adjacent leaders together where there is a split or crack at their union. Bracing creates a rigid connection between two independent parts of a tree so they move as one. Bracing is invasive as a hole must be drilled through each leader to accommodate the brace rod. It should only be considered if the consequences of limb failure are a hazard to people or to the longevity of the fruit tree. Bracing should be done with structural pruning to alleviate stress on the braced section.

Cabling allows two or more limbs to move independently but it limits range of motion to the length of cable used. Cabling is used to stabilize adjacent limbs with weak or cracked unions or to support a heavy limb by joining it to a stronger limb. Traditionally, cabling was invasive to the tree and required hardware such as eye bolts and lag bolts.

Figure 5.21: *Cabling tree branches.*

Newer products and methods exist (such as the Cobra Cable) that are non-invasive and are now the preferred method for stabilizing fruit trees. These modern cabling systems secure to the outside of the joined limbs and create a dynamic tension between them.

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

Wildlife and Mechanical Damage Stabilization

Bark damage to tree trunks and limbs is a major threat to tree longevity. Wounds to the bark and cambium layer decrease a tree's ability to conduct sap and are potential points for disease and pest entry. Grazing or rutting animals chew and rub bark off trunks and limbs, and careless equipment use can injure a tree instantly. Instances of both types of bark damage are evident at Fort Ross. Tools such as weed whackers and mowers can easily scar tree trunks and should not be used within three feet of a fruit tree trunk.

Prior to the installation of a secure deer fence around the Russian Orchard at Fort Ross, animals such as deer, cows and pigs damaged trees by chewing and rubbing the tree bark. The resultant wounds compromise the trees' ability to translocate water and nutrients throughout the vascular system. Gopher, vole and woodpecker damage is also present in some orchard areas.

Figure 5.22: *Mechanical damage to trunks can cause irreparable wounds.*

Exclusion is the best method for keeping animals and equipment from damaging orchard trees. The perimeter fence around the Russian Orchard effectively protects the trees in this orchard from animals, however, the trees to the east of the fence, and in the Call and Benitz Orchards, are unfenced and vulnerable to damage from cattle and wild pigs. The Call House and Picnic Area fruit trees are also unfenced, and are vulnerable to deer and pigs.

Sturdy welded-wire cages can be constructed to enclose individual fruit trees but must be securely staked and tied to withstand grazing pressure from determined animals. A disadvantage of using individual cages is the extra time and effort required to move or remove them to access the tree.

In the Call Orchard existing deadwood is serving as a barrier between plum trees and cattle grazing in the orchard and should not be removed.

Figure 5.23: *(left) Robust deer fencing protects trees from large animal damage.*

Figure 5.24: *(right) Welded wire cages.*

Small vertebrate pests such as gophers and voles can be very harmful to fruit trees and can kill young trees by chewing the root systems back to the tree base. Gophers, mice, voles, and pack rats affect fruit trees at Fort Ross. Manually setting traps is the most effective means of gopher control. Traps have the benefit over poisons of being non-toxic, but are time consuming to set and empty. Vegetation management is the best practice for deterring vole damage on young fruit trees, since trapping is not effective. Voles seek tall grass in which to hide from predators and will harbor in grasses around fruit tree trunks, especially if the orchard floor is mowed low while grass is left tall around tree trunks (see Chapter 6 – Integrated Pest Management, for more information on mechanical trapping of vertebrate pests).

Pack rats build large nests in tree canopies and are detrimental to the health of fruit trees. A pack rat nest is located in one olive tree in the Russian Orchard and in one plum tree in the Call Orchard. Pack rats chew on leaves, fruit and branches and their nests should be removed by knocking them down and removing the nest debris. Personal Protective Equipment (PPE), including respirators should be worn when removing the nests.

Figure 5.25: *(left) Pack rat nest in olive tree (D-OeR-15).*

Figure 5.26: *(right) Cow grazing under English walnut tree (F-JrR-13) in Call Orchard.*

Orchard Floor Stabilization

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

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

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

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

Figure 5.27: *(left) Call Picnic Area trees with encroaching orchard floor vegetation.*

Figure 5.28: *(right) Encroaching orchard floor vegetation in Russian Orchard.*

Figure 5.29: *(left) Riding mowers used to mow between orchard trees.*

Figure 5.30: *(right) A Pulaski is useful for small diameter shrub removal.*

Herbicides must be used cautiously around fruit trees due to the risk of harming the tree itself. When applied carefully and precisely at the right time, however, herbicides such as glyphosate can be an effective way to manage grass vegetation. It is a particular benefit for trees to control grass within the root zone three feet from the trunk.

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

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

A major benefit of mulching within the drip line of fruit trees is a significant reduction in the need to cultivate, mow, weed whack or spray near the trunk. It also discourages voles from hiding in grass near the trunk and chewing tree

trunk bark. Mulch eventually disintegrates and should be replenished every couple of years. As with compost, keep mulch from contacting the fruit tree trunk. Apply bark mulch 4" thick to a distance of at least 2 feet from the trunk or as far as the canopy extends and reapply mulch as needed to suppress weed growth. Avoid mulch of unknown origin, such as material from tree trimming services. This may contain weed seeds or invasive plant parts that can spread into the orchard. Create mulch or purchase it from a reputable source.

Figure 5.31: *(left) A young tree engulfed by vegetation after mowing can lead to weed eating too close to trunk.*

Figure 5.32: *(top, right) Large shrubs and trees can be difficult to remove by digging: flush cutting and treating with herbicide is generally less invasive.*

Figure 5.33: *(below, right) An early season application of herbicide at the appropriate concentration for grass obviates the need for weed whacking.*

Figure 5.34: *Mulched trees with no competing vegetation under the canopy.*

Germplasm Conservation and Propagation

As the oldest apple, pear, Capulin cherry, and Sweet cherry trees at Fort Ross are reaching the end of their lives (the olive trees have great longevity and may live for centuries), germplasm conservation is recommended as part of the scope of stabilization. Germplasm conservation preserves the genes of each variety and each species (the full complement of genotypes) in the orchard in perpetuity. The Contemporary Era apple and pear trees in the Russian Orchard preserve the germplasm in situ.

Conservation can also be achieved by two means:

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

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

Propagating genetic clones of historic fruit trees for

Figure 5.35: *Joining the scion (left) with the rootstock (right) using a specialized grafting tool.*

conservation and future replacement uses an ancient technique known as grafting. Most cultivated fruit trees consist of two individual trees joined, or grafted together: the scion, or aerial parts of the tree (trunk, limbs, canopy), and the rootstock, the root crown at the base of the trunk and the root system.

Combining two different trees takes advantage of the unique strengths of each: for example, the scion of one tree will have desirable fruit while the rootstock of another may exhibit disease resistance. The same technique allows historic orchard managers to conserve desirable historic trees by grafting scions of the historic trees onto rootstocks of compatible species. The resultant tree will essentially be the same as the parent tree. For the sake of historical accuracy it is important to choose the appropriate rootstock, however, as various rootstock lines will affect the ultimate size of the grafted tree.

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

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

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

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

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

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

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

To send germplasm samples to a repository, each set of cuttings should be placed in a labeled, zippered plastic bag with damp tissue paper, and then refrigerated until packaging and express mailing to the USDA Germplasm Repository can occur. Conservation services can be provided at the USDA National Plant Germplasm Repositories (NPGR) through the development of a cooperative agreement between California State Parks and USDA NPGR (see Resources/ Contacts section at the end of the document for germplasm repository contact information).

Hazardous Trees

It must be emphasized that public safety considerations are paramount where trees are concerned. Any tree in or near an orchard that presents an imminent threat to human safety must be cordoned off with protective barriers, dismantled to a point where it is no longer a hazard or if necessary through lack of mitigation options, completely removed. Potentially hazardous trees include the Eucalyptus encroaching around the Call Picnic Area and the redwoods within and adjacent to the Russian Orchard. Even minor limbs falling from these trees could cause grave injury or damage to adjacent resources.

SUMMARY

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