

DOS GNOMOS RANCH

Mark Dowdle and Gary Adair

CELEBRATING OVER 40 YEARS GROWING TOGETHER



GNOMES: GUARDIANS OF LAND AND SOIL

Executive Summary - Farm Viability

Dos Gnomos Ranch will be a small commercial orchard operation on a two-acre parcel of prime agricultural land off Hillcrest Road on Table Bluff near Loleta, California.

All aspects of the site including soil profile, microclimate, airflow, environs and proximity of market make this perfectly suited to growing selected tree fruits.

Fruits will include Pineapple Guava (*Feijoa sellowiana*), Persimmon (*Diospyros kaki*), Fig (*Ficus carica*), low-chill varieties of Pear (*Pyrus communis*) and wide range of Apple (*Malus*) varieties selected for versatility in cider making, cooking and eating fresh. All Apple and Pear varieties will be grafted on semi-dwarf rootstock. All fruits planned for this operation are chosen for their low water requirement, drought tolerance and disease resistance.

No synthetic chemical inputs will be used. Rather, this operation will rely entirely on holistic cultivation practices for healthy production of clean produce and diligent protection of the environment. The inherent resilience of the chosen plants and the many ideal attributes of this choice agricultural site make this especially feasible.

A large percentage of this two-acre parcel will be devoted to clusters and strips of high-density plantings to maximize available space. The practice of high-density plantings on appropriate rootstocks facilitates easier maintenance, higher productivity and reduced inputs. This approach, first popularized in Europe, is increasing rapidly in North America and globally because it conserves resources and land.

The farm's target market will be local, ranging from farmers' markets and food cooperatives to boutique and hobbyist cider makers and other secondary producers.

The partners have many years experience in growing tree crops and each comes from a family with a long history of orcharding in California. Presently the partners are growing a wide range of apple cider varieties, pineapple guava, pears and olive trees on a very small portion of 80 acres of remote nature preserve they have owned and maintained for the past 15 years in Trinity County. Their stewardship there involves extensive oak woodlands restoration, riparian protection, wildlife habitat improvement and forest health projects — much of it in collaboration with USDA's Natural Resource

Conservation Service. Previously, the partners grew apples, cherries, olives, pineapple guava, figs and other fruits for 25 years on the western slope of the Tehachapi Mountains of Kern County.

This new endeavor will incur no indebtedness. The partnership already owns all necessary equipment and essential resources, and has ample capital to establish and maintain operations for years into the future. The partners are both retired from most professional activities and are able to devote the time and physical effort necessary to establish and nurture the orchard. Both partners have considerable experience in public outreach, communications and marketing.

The parcel is on land deemed by the State of California to be Farmland of Statewide Importance. This is due to the exceptionally high quality of the soils for agricultural production and its present-day scarcity. According to the custom soil resource report for this specific parcel, from USDA's Natural Resource Conservation Service, 99.8 percent of subject site is comprised of Hookton-Tablebluff Complex soils.

The attributes of both Hookton and Tablebluff series include very deep (to 80 inches) soils that are non-saline, non-hydric, with high available water capacity and good transmissiveness. Depth to water table is typically 20 to 39 inches.

Mean annual precipitation for Hookton-Tablebluff Complex is 41 to 53 inches; mean annual temperature 52 to 55 degrees Fahrenheit; frost-free period is 270 to 330 days. The site's airflow and solar exposure are also especially favorable for fruit trees.

The two-acre site is surrounded on three sides by small, similar-sized parcels containing single family homes, none engaged in agricultural use of the soil. Beyond these are sprawling pasturelands used for beef production and boarding horses. Environmentally sensitive state and federal wildlife preserves are nearby. Growing fruit trees in a holistic manner on this site will pose no conflict with any surrounding uses.

The Eel River Area Plan of the Humboldt County Local Coastal Program stipulates that these prime agricultural lands must have continued agricultural use or uses that maintain the economic viability of agricultural operations on them.

With that in mind, Dos Gnomos Ranch partners intend to use this rare agricultural land in a manner that adheres to the spirit of its codified protections while carefully safeguarding these extraordinary natural resources.

Mission, Goals and Objectives

Mission Statement

The mission of Dos Gnomos Ranch is to grow and market tree fruit for local consumers and entities in a holistic manner that is sensitive to and protective of the surrounding environment.

Goals and Objectives

As an endeavor in the developing stages, Dos Gnomos has several goals relating to environment protection, growth of the business and sustainability.

Goal I

Create thriving, productive fruit trees with a 100 percent survival rate

Objective A: Establish high-density plantings of thriving fruit trees within two years of establishing a farm residence and infrastructure.

Actions include:

- Plant trees using a mycorrhizal gel root dip then mulch with compost to nurture the soil food web that in turn promotes healthy root and tree development.
- Install drip irrigation. Utilize rainwater harvested off house and barn to augment well water.
- Install tree row trellising and protective deer mesh — as needed.
- Consistently monitor and properly maintain trees.
- Rely on natural/biologic/organic approaches to ensure healthy plants, avoid disease and pests, and to resolve observed deficiencies.

Objective B: Once established, utilize a holistic/biologic approach to ensure fruit tree health and productivity.

Actions include:

- Incorporate best cultivation practices, including closely monitoring trees and soil moisture, applying appropriate mulches and judicious pruning.
- Implement horticultural practices and principles set forth in two books by Michael Phillips: *The Holistic Orchard: Tree Fruits and Berries the Biological Way* (2011) and *The Apple Grower* (2005).

- Incorporate environmentally sensitive methods such as sheep and/or poultry to control grasses and weeds.
- Consult with fruit tree specialists about specific challenges that arise.
- Coordinate with Agricultural Commissioner to trap and monitor insect pests.
- Rely on beneficial insects (i.e., wasps), including those locally extant for control of insect pests such as borer larvae.
- Incorporate honeybees if needed to augment naturally present pollinators.

Goal II

Develop and implement marketing strategies for Dos Gnomos tree fruit

Objective C: Once trees are planted, begin to identify and engage potential customers.

Actions include:

- Sponsor, join and support the North Coast Growers Association, Humboldt County Farm Bureau and similar agriculture business organizations.
- Consult with Humboldt County Agricultural Commissioner personnel.
- Begin to identify local cider makers, food coops and other potential customers;
- Begin to identify other potential secondary producers in the region.
- Produce detailed information on cider varieties and other tree fruits being raised at Dos Gnomos Ranch.
- Continue to gather intelligence on potential markets.
- Participate in community and engage in philanthropic activities to increase visibility of Dos Gnomos.
- Build anticipation with knowledge that significant quantities of fruit production are at least three to four years in the future.
- Continue to develop contact lists.
- Conduct open house visitations to farm in second and third year after trees planted.

Background and Experience of Principals

The partners in Dos Gnomos Ranch are Gary Adair and Mark Dowdle. Both come from families with farm and ranch experience.

Dowdle has a Bachelor of Science in Environmental Resources Management and a Bachelor of Arts in Communications with a Minor in Applied Ethics. He most recently retired from Trinity County Resource Conservation District where for nine years he was involved in environmental education, public outreach and grants writing. He was also involved with the Trinity County Collaborative Group, established with support from the U.S. Department of Agriculture. Prior to that, Dowdle worked for nine years in information resources at California State University, Bakersfield. Previously he was editor of the *Mojave Desert News* before leaving to establish the Kern County news bureau of the *Antelope Valley Press*.

Dowdle grew up in the Santa Clara Valley when it still had many orchards and where his family had a small orchard he helped tend. His grandparents had a citrus ranch in San Diego County and a vineyard and fruit orchard in Sonoma County.

Adair has a Bachelor of Science in Recreation Education with an Emphasis in Public Administration. He continues to be an on-call trainer/instructor for UC Davis Extension Continuing and Professional Education. Adair has worked with the Extension for well over a decade. His work has included providing professional development trainings for county departments in Humboldt County and throughout the state. Prior to this, Adair held administrative positions in Santa Cruz and Kern counties. Previously, Adair was executive director of the Arts Council of Kern and finance director for a council of Girl Scouts USA.

Adair also grew up in Santa Clara Valley where his family is one of six generations of fruit growers. The first members came to California in 1849 and established stone fruit orchards in the Bay Area. They also were involved in produce shipping (sail-powered) across San Francisco Bay and up the Sacramento Delta. Adair's ancestors continued to establish large orchards throughout Santa Clara County. One of his great-grandfathers was a founder and first general manager of Sunsweet Growers, Inc., who also owned the largest sugar prune orchard in California in the early 1900s.

Current Land Stewardship Activities

The partners own and maintain a remote 80 acre property in Trinity County, very close to the Chanchelulla Wilderness Area. The property has two streams, one of which is considered by California Department of Fish and Wildlife (CDFW) biologists to be a prime salmonid (Steelhead) spawning and rearing habitat in this sub-basin of the South Fork of the Trinity River. The partners work closely with USDA's Natural Resource Conservation Service (NRCS) to implement conservation practices that protect and improve wildlife habitat. This includes practices to protect and enhance the riparian corridors and reduce thermal and sediment loading of the surface waters.

Other practices involve extensive oak woodlands restoration and creation of shrub mosaics and other habitat to promote wildlife diversity and population increase. The partners have established an excellent track record and working relationship with NRCS and other natural resources agencies.

A very small area of their 80 acres has been planted to apples and pears in a high-density style wherein fruit trees are five feet apart. This planting is on part of a large flat four-acre area that in the 1800s and early 1900s was the site of mine tailings piles. It had been graded over sometime in the 1920s-1960s for use as an active timber deck to accommodate timber harvesting in the area. This flat area was seriously degraded and slow to recover. The partners implemented restoration agriculture and holistic practices to reclaim this small orchard area and make it fertile again. The fruit trees they planted are thriving. This is attributable to the healthy matrix of the conserved natural surroundings as well as the clean cultivation practices being employed.

ATTACHMENTS:

Dos Gnomos Ranch Planting Guide Map

Parcel Information

Dos Gnomos Ranch Soils Report

Feijoa Sellowiana (Acca Sellowiana)

Fruits of Humboldt Bay

Orchard Systems

Modern Apple Training Systems

Eel River Area Plan of the Humboldt County Coastal Plans

Assessor Parcel Number 308-241-043-000
Old APN 308241014
Site Address
131 HILLCREST DR
Site City LOLETA
Site Zip 95551
Assessor Parcel Map Book 308-24 Page
Assessed Lot Size 2.00
GIS Acres 1.96
Tax Rate Area 109006
Current General Plan AEG(160)
Community Plan ERAP
Zoning with Combining Zones AE-160/A
Zoning Ordinance Date
Use Code Description Vacant Rural Residential, 1-5 ac
Use Code 3001
Development Plan on file(Y/N)
In Coastal Zone (Y/N) Y
Coastal Jurisdiction O
In 100 Year Flood Zone (Y/N) N
FEMA FIRM Flood Rating and Panel Number
Year Built
Agricultural preserve (Y/N)
Alquist-Priolo fault hazard zone(Y/N) N
Geologic report requirements
Relative Slope Stability 1



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Humboldt County, Central Part, California



Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

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scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Map Scale: 1:607 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

- Area of Interest (AOI)
- Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points
- Special Point Features**
 - Blowout
 - Borrow Pit
 - Clay Spot
 - Closed Depression
 - Gravel Pit
 - Gravelly Spot
 - Landfill
 - Lava Flow
 - Marsh or swamp
 - Mine or Quarry
 - Miscellaneous Water
 - Perennial Water
 - Rock Outcrop
 - Saline Spot
 - Sandy Spot
 - Severely Eroded Spot
 - Sinkhole
 - Slide or Slip
 - Sodic Spot
- Water Features**
 - Streams and Canals
- Transportation**
 - Rails
 - Interstate Highways
 - US Routes
 - Major Roads
 - Local Roads
- Background**
 - Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
 Web Soil Survey URL:
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Humboldt County, Central Part, California
 Survey Area Data: Version 6, Jun 1, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Oct 11, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
230	Hookton-Tablebluff complex, 2 to 9 percent slopes	1.9	99.8%
231	Hookton-Tablebluff-Cannonball complex, 9 to 15 percent slopes	0.0	0.2%
Totals for Area of Interest		1.9	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the

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development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Humboldt County, Central Part, California

230—Hookton-Tablebluff complex, 2 to 9 percent slopes

Map Unit Setting

National map unit symbol: 2ljdr
Elevation: 30 to 820 feet
Mean annual precipitation: 41 to 53 inches
Mean annual air temperature: 52 to 55 degrees F
Frost-free period: 270 to 330 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hookton and similar soils: 45 percent
Tablebluff and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hookton

Setting

Landform: Erosion remnants
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

A1 - 0 to 4 inches: loam
A2 - 4 to 15 inches: loam
Bt - 15 to 27 inches: clay loam
Bw1 - 27 to 39 inches: clay loam
Bw2 - 39 to 60 inches: clay loam

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 10 to 20 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 10.9 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Hydric soil rating: No

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Description of Tablebluff

Setting

Landform: Erosion remnants
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian deposits over mixed alluvium

Typical profile

Ap1 - 0 to 6 inches: silty clay loam
Ap2 - 6 to 11 inches: silty clay loam
AB - 11 to 16 inches: silt loam
Bt1 - 16 to 20 inches: silty clay loam
Bt2 - 20 to 29 inches: silty clay loam
Bt3 - 29 to 42 inches: silty clay loam
Bt4 - 42 to 49 inches: silty clay loam
Bt5 - 49 to 73 inches: clay loam

Properties and qualities

Slope: 2 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 20 to 39 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Very high (about 12.2 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Megwil,

Percent of map unit: 5 percent
Landform: Marine terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F004BX120CA - Redwood-Sitka spruce/California huckleberry-salmonberry/western swordfern-deer fern, marine terraces, loam
Hydric soil rating: No

Cannonball

Percent of map unit: 5 percent
Landform: Marine terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread

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Down-slope shape: Linear

Across-slope shape: Linear

Ecological site: F004BX121CA - Redwood-Sitka spruce/salal-California huckleberry/western swordfern, marine terraces, marine deposits, sandy loam
an

Hydric soil rating: No

Urban land, residential

Percent of map unit: 5 percent

Landform: Marine terraces

Landform position (two-dimensional): Summit

Landform position (three-dimensional): Tread

Down-slope shape: Convex

Across-slope shape: Linear

Hydric soil rating: No

231—Hookton-Tablebluff-Cannonball complex, 9 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2ljdn

Elevation: 30 to 820 feet

Mean annual precipitation: 42 to 54 inches

Mean annual air temperature: 52 to 54 degrees F

Frost-free period: 275 to 330 days

Farmland classification: Not prime farmland

Map Unit Composition

Tablebluff and similar soils: 40 percent

Hookton and similar soils: 35 percent

Cannonball and similar soils: 15 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tablebluff

Setting

Landform: Erosion remnants

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Eolian deposits over mixed alluvium

Typical profile

Ap - 0 to 18 inches: loam

Bt1 - 18 to 24 inches: silt loam

Bt2 - 24 to 35 inches: silt loam

Bt3 - 35 to 41 inches: silt loam

Bt4 - 41 to 45 inches: silt loam

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Bt5 - 45 to 55 inches: clay loam

C - 55 to 63 inches: clay loam

Properties and qualities

Slope: 9 to 15 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Moderately well drained

*Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 2.00 in/hr)*

Depth to water table: About 20 to 39 inches

Frequency of flooding: None

Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: Very high (about 12.5 inches)

Interpretive groups

Land capability classification (irrigated): 4e

Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: C

Hydric soil rating: No

Description of Hookton

Setting

Landform: Erosion remnants

Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Tread

Down-slope shape: Linear

Across-slope shape: Linear

Parent material: Mixed alluvium

Typical profile

A1 - 0 to 5 inches: loam

A2 - 5 to 12 inches: loam

Bw - 12 to 26 inches: loam

C1 - 26 to 36 inches: clay loam

C2 - 36 to 61 inches: sandy clay loam

Properties and qualities

Slope: 9 to 15 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Somewhat poorly drained

*Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20
to 0.60 in/hr)*

Depth to water table: About 10 to 20 inches

Frequency of flooding: None

Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water capacity: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): 3e

Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: C/D

Hydric soil rating: No

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Description of Cannonball

Setting

Landform: Marine terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, tread
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Mixed marine deposits

Typical profile

A1 - 0 to 3 inches: silt loam
A2 - 3 to 11 inches: silt loam
Bt1 - 11 to 27 inches: loam
Bt2 - 27 to 61 inches: clay loam
Bt3 - 61 to 76 inches: clay loam

Properties and qualities

Slope: 9 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high
(0.20 to 2.00 in/hr)
Depth to water table: About 20 to 39 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 11.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Halfbluff

Percent of map unit: 5 percent
Landform: Marine terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F004BX118CA - Sitka spruce-redwood/salal/western brackenfern, marine terraces, marine deposits, fine sandy lo
Other vegetative classification: Forest Type IV, coastal (RNPF004CA)
Hydric soil rating: No

Urban land, residential

Percent of map unit: 5 percent
Landform: Marine terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

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Hydric soil rating: No

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FEIJOA



F4F29

Feijoa sellowiana O.

Myrtaceae

Common Names: Feijoa, Pineapple Guava, Guavasteen.

Related Species: In more recent times *Feijoa sellowiana* has been renamed *Acca sellowiana*, but most sources still use the older name.

Distant affinity: Eugenias (*Eugenia* spp.), Guavas (*Psidium* spp.), Jaboticaba (*Myrciaria* spp.).

Origin: The feijoa is native to extreme southern Brazil, northern Argentina, western Paraguay and Uruguay where it is common in the mountains.

Adaptation: Feijoas prefer cool winters and moderate summers (80° to 90° F), and are generally adapted to areas where temperatures stay above 15° F. Flower production is poor in areas with fewer than 50 hours of chilling. The flavor of the fruit is much better in cool than in warm regions. Even though the plants are relatively hardy, sudden fall frosts can damage ripening fruit and late spring frosts can destroy blossoms. Spring frost damage is most likely in mild-winter areas, where the plants are not completely hardened off and respond to warm spells by blooming early.

DESCRIPTION

Growth Habit: The feijoa is a slow-growing evergreen shrub that can reach 15 ft. high and 15 ft. wide. The bark is pale gray and the spreading branches are swollen at the nodes and white-hairy when young. In addition to the fruit it provides, the shrub also doubles handsomely as a landscape specimen. When planted close together, the shrubs make a nice hedge, screen, or windbreak. Feijoas can also be espaliered or trained as a small tree (20 to 25 ft. tall) with one or more trunks. The wood is dense, hard, and brittle.

Foliage: The evergreen, thick, leathery leaves of the feijoa are opposite, short-petioled and bluntly elliptical. In size they range from 1 to 2-1/2 inches long and 5/8 to 1 inch wide. The leaves are smooth soft green on top and silvery underneath, flashing nicely in a gentle breeze.

Flowers: The 1 inch showy, bisexual flowers, borne singly or in a cluster, have long, bright red stamens topped with large grains of yellow pollen. Flowers appear late, from May through June. Each flower contains four to six fleshy flower petals that are white tinged with purple on the inside. These petals are mildly sweet and edible and can make a refreshing addition to spring salads. Birds eating the petals pollinate the flower.

It has been said that feijoa pollen is transferred by birds that are attracted to and eat the flowers, but bees are the chief pollinators. Most flowers pollinated with compatible pollen show 60 to 90% fruit set. Hand pollination is nearly 100% effective. Two or more bushes should be planted together for cross-pollination unless the cultivar is known to be self-compatible. Poor bearing is usually the result of inadequate pollination.

Fruits: The fruits range from 3/4 to 3-1/2 inches long and vary in shape from round to elongated pear shape, with the persistent calyx segments adhering to the apex. The waxy skin is dull blue-green to blue or grayish green, sometimes with a red or orange blush. Skin texture varies from smooth to rough and pebbly and is 3/16 to 5/8 inch thick. The fruit emits a strong long-lasting perfume, even before it is fully ripe. The thick,

white, granular, watery flesh and the translucent central pulp enclosing the seeds are sweet or subacid, suggesting a combination of pineapple and guava or pineapple and strawberry, often with overtones of winter green or spearmint. There are usually 20 - 40, occasionally more, very small, oblong seeds hardly noticeable when the fruit is eaten.

CULTURE

Location: To protect the fruit from sunburn and other adverse effects of high temperature, choose a plant site away from hot, reflected sun. The feijoa can tolerate partial shade and slight exposure to salt spray. They also make an excellent foundation planting, either singly or as an informal hedge.

Soil: Feijoas will grow in a wide variety of soils. The best harvests, however, come from plants growing in well-drained soil with a pH between 5.5 and 7.0. They are fairly salt tolerant, but salinity slows growth and reduces yields.

Irrigation: Foundation plantings of feijoas in summer dry California have survived for several years without supplemental water. Lack of water, however, will cause the fruit to drop. For quality harvests, water deeply on a regular basis, especially during flowering and fruit periods, and mulch the soil around the plants to protect the shallow roots.

Fertilization: Feijoas grow slowly and require only light applications of a complete fertilizer. A feeding of 8-8-8 NPK once every two months can speed growth.

Pruning: Pruning is not required to keep plants productive, but a light pruning in the summer after fruit is harvested will encourage new growth and increase yields the following year. Thinning the plant also permits easier harvesting. When grown as a hedge, the feijoa responds well to heavy pruning or shearing, but this reduces flower and fruit production.

Propagation: The feijoa grows easily from seed, but the seedlings are not always true to type. Seeds are separated by squeezing the seedy pulp into a container, covering with water, and letting the liquid stand for 4 days to ferment. The seeds are then strained out and dried before

sowing. The seeds will retain viability for a year or more if kept dry. Germination takes place in 3 weeks. The plant fruits in 3 - 5 years from seed. Vegetative means are necessary to reproduce a variety. Young wood cuttings will root within two months with bottom heat and mist. Whip, tongue or veneer grafting methods are sometimes successful, as is air-layering and ground layering. Cutting-grown plants of named varieties are most desirable, because they can be trained in a variety of ways, and can be maintained as multitrunked shrubs without concern that suckers will develop into "rogue" branches.

Pests and diseases: The feijoa is remarkably pest and disease-resistant. It is occasionally attacked by black scale in California, as well as fruit flies where that is a problem.

Harvest: In southern California the fruits ripen 4-1/2 to 6 months after flowers appear and in 5-1/2 to 7 months in the San Francisco area. As the fruit matures, its color changes almost imperceptibly. The best way is to allow them to fall from the tree. Giving the tree a shake and gathering the fruit from the ground every couple of days is the usual method of harvesting. To keep the fruit from bruising, place a tarp or other large cloth under the tree to catch them as they fall. Feijoas can also be picked when firm and mature and allowed to ripen at room temperature, although the quality will not be as good as tree ripened fruit. Mature fruit can be stored in the refrigerator for about a week, but after that the quality declines. Feijoas are mainly eaten fresh as a dessert or in salads, but can also be cooked in puddings, pies, etc. After peeling, the fruit should be immediately dipped into water containing fresh lemon juice to prevent the flesh from turning brown.

Commercial Potential: In California the feijoa is grown in a limited way for its fruit, especially in cool coastal locations, mainly around San Francisco. There has also been a major effort in New Zealand to commercialize the feijoa. Both domestic and imported fruit can often be found in the markets, but the demand does not seem to be great.

CULTIVARS

Apollo

Medium to large, oval fruit. Smooth, thin, light-green skin with blue-green surface bloom, subject to bruising and purpling. Pulp well-developed, slightly gritty. Flavor very pleasant, quality excellent. Ripens mid to late-season. Tree upright and spreading, to 8 ft. tall, vigorous and productive. Self-fertile, and will pollinate Gemini.

Choiceana

Originated in Australia. Small to medium-sized, round to oval fruit, 2 to 3-1/2 inches long. Skin fairly smooth. Flavor and quality good. Ripens in midseason. Tree moderately vigorous, spreading. Almost or always, but not less than 42% self-fertile.

Coolidge

Originated in Australia prior to 1908. Small to medium-sized fruit, 4 or more inches in length and 2-1/2 inches in diameter. Form pyriform to oblong or elongated. Skin somewhat wrinkled. Flavor mild, indifferent quality. Tree upright and strong growing, a reliable and heavy bearer, 100% self-fertile. The most widely planted cultivar in California.

Edenvale Improved Coolidge

Originated in Santa Cruz, Calif. by Frank Serpa of Edenvale Nurseries. Large, oblong fruit of very good to excellent flavor and quality. Ripens in October. Tree slow growing. Self-fertile, precocious and productive. Grows best in climates similar to cool, coastal areas of southern California.

Edenvale Late

From Edenvale Nurseries. Medium-sized, oblong fruit of very good to excellent flavor and quality. Ripens late, in January, and over a long period of time. Tree slow growing. Self-fertile, very productive. Grows best in climates similar to cool, coastal areas of southern California.

Edenvale Supreme

From Edenvale Nurseries. Medium-sized, oblong fruit of very good to excellent flavor and quality. Ripens in November. Best eaten soon after harvest. Tree slow growing. Self-fertile, precocious and productive. Grows best in climates similar to cool, coastal areas of southern California.

Gemini

Fruit small to medium, egg-shaped. Skin very smooth, thin, dark green with a heavy bloom. Flavor and texture excellent. Ripens in early autumn, earlier than Apollo. Tree upright, spreading, to 8 ft tall. Moderately vigorous, high yielding, partially self-fruitful, but cross pollination is recommended for best fruit quality.

Mammoth

Selected in New Zealand from seedlings of the Choicena. Large, round to oval fruit, to 8-1/2 ounces, resembling Coolidge. Skin thick, somewhat wrinkled. Flesh somewhat gritty, quality and flavor very good. Matures early in midseason. Softer and not as good a shipper as Triumph. Tree of upright habit, to 10 ft. tall, strong growing. Self-fertile, but bears larger fruit, with cross-pollination.

Moore

Large, flavorsome fruit. Ripens in midseason. Very vigorous plant. Recommended for California.

Nazemetz

Originated in San Diego, Calif. by Alexander Nazemetz. Large, pear-shaped fruit, averaging 3 ounce in weight. Side walls moderately thin. Pulp translucent and sweet. Flavor and quality excellent. Ripens in late October to mid-December. Unlike that of many other cultivars, the pulp of Nazemetz does not darken after being cut or as it ripens, but retains its clear color. Tree self-fertile, but bears most heavily when cross-pollinated. Good pollinator for Trask.

Pineapple Gem

Originated in Azusa, Calif. by Monrovia Nursery. Small, round fruit of good to very good quality. Mid to late season ripening. Tree self-fruitful but bears heavier crops if pollinated. Does poorly under cool, coastal conditions.

Trask

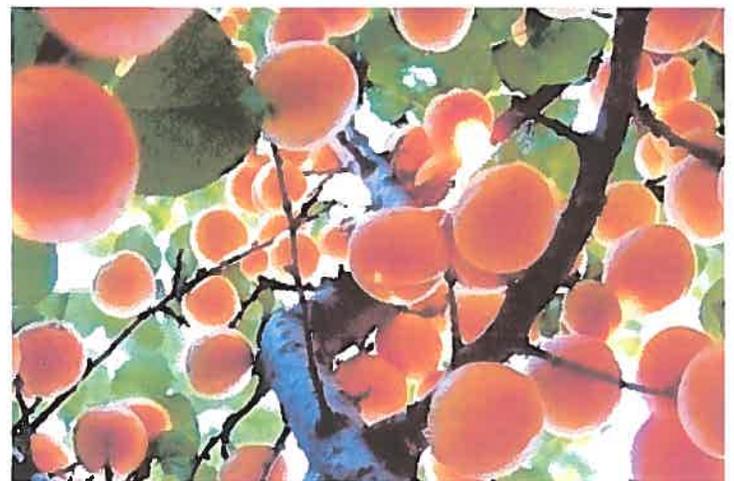
Originated as a bud sport of Coolidge. Medium to large, oblong fruit, up to 3-1/2 inches long and weighing 3 to 5 ounces. Rough, dark green skin. Shells thicker and grittier than Coolidge. Flavor and quality good to very good. Ripens early. Tree self-fertile, but most productive when cross-pollinated. Precocious. Ideal pollinator for Nazemetz.

Triumph

Selected in New Zealand from seedlings of the Choiceana cultivar. Short, oval, plump fruits., not pointed as those of Coolidge, medium to large. Skin uneven but firm. Flesh somewhat gritty but with good seed to pulp ratio. Excellent sharp flavor. Ripens to midseason. Tree upright, of medium vigor. Bears heavily if pollinated. Good pollinator for Mammoth.

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Fruits of the Humboldt Bay

A Community Sourced Planting Guide (16th Edition)

Edited by Sean Armstrong

Printed on 100% Post Consumer
Recycled Content Paper





This book is intended to help plant a:

Permaculture Food Oasis
Public Park Plantings
Wedding Arbor
Fruits for the Grandkids
Citrus Grove

Privacy Hedge
Edible Native Forest
Back-Yard Orchard
Mushrooms
Hot Weather Crops

In Our Coldest of Climes

How and why was this guide written?

This booklet was written by interviewing more than 60 local experts: farmers, lifelong gardeners, professional orchardists, nursery owners, indigenous wildcrafters, and permaculture practitioners, all following organic or better practices to produce the results they report. Here is their hard won wisdom, which is intended to help you grow organic, unfussy fruits, nuts, bulbs, mushrooms and vegetables outdoors. Please plant extra fruits, and share them with your neighbors, and particularly the children and low-income members of our community who suffer from low-nutrition food. So few fruits at the grocery store are ripe, let alone at peak nutrition, and many wonderful fruits can only be gotten by growing them yourself—pie cherries, Chilean guavas, goumis and honeyberries are unavailable for love or money. And many fruits, like ripe peaches and handfuls of blueberries, are too expensive to eat in the quantities you want. So grow your own, and please share.

Thank you for the collective wisdom of: **Bradley Thompson and Karen Shepherd** for your inspiring fruit forest, **Shail Pec-Crouse's** tireless scientific experimentation with varieties, **Jacques and Amy Neukom's** Edenic organic, dry farmed fruits and heirloom preservation efforts, **Rita Jacinto & Laurie Levey's** of **Flying Blue Dog Nursery** for their coastal heirloom annuals expertise and seed saving leadership, **Sam Polly and Jim Polly**--two generations of innovative and smart orchardists, **Dick Hansis'** patient success with peaches and plums, **Richard Engel's** and **Basilia's** lovely Sunset garden on Western, **Kevin Johnson and Lisa Brown** solutions-oriented fruit and nuts orchard, **Kathy Marshall and Rocky Drill's** deep straw-mulched raised beds with anti-slug copper strips and glued-down pennies, **Wiyot Cultural Liaison** and **Founding Tribal Chair Cheryl Seidner** for her childhood recollections of hazelnuts and more, the beautiful and inspiring **Potowat Health Village** restored native landscape and **Ed Mata's** CSA farm, **Eric Johnson** of **Samara Nursery** for his comprehensive native plants knowledge, **Isaiah Webb's** healing food farming at the Mad River Hospital, **Eddie Tanner's** first class strawberries at **DeepSeeded Community Farm**, the inspiring and educational food forest of **CCAT**, **Marsh Commons'** fragrant citrus and blueberry hedge, **Karen Davidson's** berry vines for the grandchildren, **Fawn Scheer and Erin Derden-Little** creations in the **Greenway Gardens** and **Redwood Roots**, **Tyler John Waterman's** healthy hops at his Farmhouse homestead, **Heather Plaza and Johnny Gary's** dedication to doing it right at **Organic Matters**, **Marc Robbi's** pioneering work at **Rolling River Nursery**, **Marianne Cipolla and Craig Knox's** urban orchard, the Hilfiker Street orchards of **Tim Lauck, Marisela & Dan Wassenaar, Kelly Barrett's** historic orchard and blueberries, **Don Nielsen's** apple and pear orchard in the Bottoms, the inspiration of the **Garden House**, **Wayne Hawkins** tending HSU's many landscaping fruit trees and use of agricultural vinegar instead of herbicides, **Kashi Albertsen's** luscious blueberry gardens, **Mark DuPont's** mastery in the heirloom tree nursery at the permaculture paradise called **Sandy Bar Ranch**, **Marnin Robbins and T Griffin** beautiful backyard orchard in Windsong and inspiring work at **Potowat Health Village's** CSA, **Ino Riley's** second generation local fruit growing wisdom and sweet strawberries, **Paul Giuntoli's** fourth generation local farming wisdom, **Susan Ornelas's** spectacular green tree grape and leadership at **Bayside Community Park**, **Xandy Grube** for revering native trees, **Danielle Newman** for growing Etter's apples, **Dick LaForge** for inspiring generations of students, **Lisa Zierer** for gorgeous tomatoes, **Russell Terry's** chestnuts, **Xandi Manns** for her commitment to public plantings of native edibles, **Michael Winkler's** sidewalk peaches, **Jared Goebel** for luma-nosity, **Colin, Erica and Kai Patrick** for copy editing and mushroom knowledge, **Robert Arena's** rare nectarine discovery, **Jeff Strehlow** for elderberry advocacy, and the gorgeous printing job that **Aaron and Robert** provide at Bug Press.

Editor: Sean Armstrong is co-owner of Tule Fog Farm with the real farmer, **Shail Pec-Crouse**, who is the inspiration and muse for this booklet. Sean's profession is designing solar powered subsidized housing for farmers, seniors, working families, the homeless and veterans, and he's been sneaking fruit trees into apartment complex designs since 2005. Many thanks to Karen and Richard for the inspiring jungle gardens of Sean's childhood. Please contribute your own experiences to the next edition of this local growers guide to seanarmstrongpm@gmail.com!

The Challenging Local Weather Can Be Gardened with Heirloom Varieties from Around the Globe

At 65 degrees Fahrenheit, *the Humboldt Bay Bottoms has the nation's coldest average summertime temperature*. We have a relatively warm winter with 400-600 "chill hours" (hours when the temperature is below 45F), so some stone fruits and apples that need a colder winter do not succeed as well here. The Bay Bottoms' get up to 50mph winds and drizzle equaling 40-45" inches of rain from October through May. The 50F California Current wells up in the summer, while huge plumes of fog roll in off the Pacific ocean surf and more fog whips off the evaporative basin of the Humboldt Bay, keeping humidity at 60%-80% on sunny summer days. Clear winter nights produce our coldest temperatures at 27F, enough to kill the leaves of more tender plants like citrus.

Today native plants cultivated by the Wiyot co-exist around the Bay with hundreds of imported species from other cool, moist places: the coastal plains Patagonia, the Mediterranean, New Zealand, coastal China, Korea and Japan, coastal Australia, the highlands of Peru, the apple forests of Kazakhstan, the plains of Russia, the Black Sea of Turkey, the meadows of Afghanistan, bi-coastal Canada, the East Coast of North America and those that share the Jet Stream current such as Iceland, Scandinavia, France, and the islands of Ireland and Great Britain. Enjoy!



**“Blood,” “Frost,” “Avalon Pride,”
“Betty,” “Charlotte” and “Q-1-8”
Peaches (*Prunus persica*)**

The **Blood** (or Indian Blood) peach was farmed by the Tsalagi (Cherokee) Nation for hundreds of years after its arrival from Europe ~1500. For yellow-fleshed peaches originally developed in China, the dependable **Frost** variety is juicy and sweet, but like the sturdy **Charlotte**, it is best picked firm to ripen on the counter, or it gets mealy on the tree. **Avalon Pride** a flavorful semi-freestone, and **Betty** is sweet and productive, and all varieties have succeeded in Arcata Bottoms. For fans of white fleshed peaches, only the “**Q-1-8**” has proven itself, on Old Arcata Road.



**“Arctic Queen” Nectarine
(*Prunus persica nucipersica*)**

Arctic Queen is a sweet and complicated white flesh nectarine that fruits prolifically in the Arcata Bottoms and doesn't suffer from leaf curl. Other “**Arctic**” varieties—**Glo**, **Jay**, **Rose**, and **Star** are related low-chill (e.g. 250 hours) varieties and also likely successes. **Panamint** grew yellow-fleshed, sweet, aromatic and intensely flavored self-fertile freestone nectarines on Elk River Road, but suffers from leaf curl and would need a copper spray.



**“Satsuma” and “Trovita” Oranges
(*Citrus sinensis* and *C. unshui*)**

The **Trovita** orange is a hardy, thick skinned, sweet offspring of the Naval orange, while the **Satsuma** pictured above is thin skinned and tangy sweet just in time for Christmas. Both will always need to be covered on clear, cold winter nights to keep the tender leaves from freezing and falling off. **Kumquats** and **Clementines** are successful in a greenhouse.



**“Improved” Meyer Lemon
(*Citrus x meyeri*)**

Meyer lemons are the most successful citrus for our area, but need to be covered during frosty nights for 5+ years. Meyer Lemon trees can grow to 10' tall with frequent flowerings of the sweetest smelling blooms and lemons at various stages of ripeness. Marsh Commons and the former Trinity Hospital at B and 14th in Arcata, near the Eureka High School and a backyard in Loleta.



**“Bears/Persian/Tahitian” Lime
(*Citrus latifolia*)**

This lime was bred in central California by T.J. Bears in 1895. It is the cold-hardest lime and does ripen small, yellowish limes if given time, a protected, south facing wall and some cover on freezing nights (a blanket, plastic sheeting, etc.). Marsh Commons has a small but healthy example on South G St.



**“Blenheim” Apricot
(*Prunus armeniaca*)**

Apricots are an ancient type of Eurasian domesticated plum, and this hardy variety was cultivated from a seedling at Blenheim Castle, England. Like loquats, it will only succeed some years due to late frosts and cold summers. It needs 400 chill hours to set fruit, full sun and loamy soil. Greenwood Heights



**“Desert King” and “Atreano”
Figs (*Ficus carica*)**

Desert King provides mild, sweet red-fleshed figs, while **Atreano** fruits are smaller, amber fleshed and sweeter. Fig trees produce better fruits as they mature. A giant Desert King on maritime Bay St, Eureka demonstrates its hardiness, with many impressive examples around Arcata. The Atreano Fig is fruiting in the Sam Polly's Edible Hedgerow on 17th St, Arcata.



**Pawpaw
(*Asimina triloba*)**

If you miss mangoes, plant pawpaws in sandy soil. They are North America's largest native fruit, taste similar to mangoes, and are close relatives to the tropical cherimoya and custard apple. It's a 10-15' tree with bright orange fall foliage that grows well into Canada. An unknown variety fruits on Roberts Way, and the Pennsylvania variety is under trial.



Cornelian Cherries: "Red Star," "Elegant," "Pioneer," and "Yellow"
(*Cornus mas*)

Cornelian Cherry is actually a dogwood species from Greece, although the small tree doesn't look or smell like familiar dogwoods. The fruit is tart unless it ripens to the point of falling from a gently shaken tree. Tart fruit is perfect for pies and sauces. The species is partially self-fertile and will do better when planted in pairs. "Red Star" is an excellent fruiter, "Pioneer" and "Elegant" are almost as good, but the "Yellow" variety is not as hardy or productive. All three get a purplish leaf discoloration, but it is only a problem with the "Yellow" variety. Roberts Way, Arcata.



Mayhaw
(*Crataegus aestivales and opaca*)

Mayhaws are a 10' tall fruit tree native to the Southeast wetlands (e.g. Georgia, Louisiana) that do well around the Humboldt Bay. They're not sweet, but they're popular in jellies for their flavors of mango, pineapple and apple. Profuse white flowers in the spring and bright red fall leaves add to their charm. Roberts Way, Arcata



Sour Cherries: "Surefire," "Morello" and "Montmorency"
(*Prunus cerasus*)

These varieties of the S. Europe and SW Asia sour cherries are self-fertile and have dark red flesh that makes for a classic cherry pie or dried and sweetened treat. Surefire is heavily productive at the Edible Hedgerow on 17th in Arcata, and self-pitting as you pick them. Montmorency and Morello are both successful on Wyatt Lane and Foster Ave, Arcata.



"Long" Mulberry var. Pakistan
(*Morus macroura*)

Few of the 17 different species of mulberries seem to fruit well in the Humboldt Bay area, perhaps needing hotter summers, but the "Long" species is from the Himalayan mountains and grows extraordinarily long, honey-sweet berries. Pakistan is one of many varieties. Spear Ave.



Sweet Cherries: "Lapin," "Stella," and "Bing" (*Prunus avium*)

Sweet cherries do well on the Bay, especially mature trees. The short and easy-to-pick "Stella" variety produces sweet cherries on Foster Ave. The "Lapin" is a self-fertile sweet cherry that grows well on Roberts Way, Arcata. There was an 80 year old "Bing" at HSU near CCAT that produced dependably for years. The recent invasion the Two Spotted Fruit Fly has sometimes meant perforated, leaky cherries that the birds are welcome to, so pick them a day early. The "cherry slug" that nibbles leaves is actually a sawfly larvae and their damage is generally tolerable.



"Gold Nugget" Loquat
(*Eriobotrya japonica*)

Loquats are soft, complex, sweet-sour fruit from Southeast Asia that tastes "tropical" and are a popular fruit among the 2000 Portuguese families around the Bay that know them as "nêspêra." In Portugal they have two varieties of yellow loquat—sweet and sour. Loquats are unusual in that they flower in the fall. They are sensitive to frosts, so you may have 1-3 years in between good harvests. The Gold Nugget variety is the only local variety known by name, but there are local unnamed "sour" Portuguese specimens with yellow flesh. They like the hot summers inland, such as a big stand on Highway 36 east of Hydesville. On the Bay they're found on Anina Way, Los Bagels and the parking lot opposite the Jacoby Storehouse, Arcata.

Dry Gardening Established fruit trees want, but do not need to be watered during the summer. There are many solutions to retaining soil moisture—six inches of loose straw or wool bedded 2-3 feet out from the stem base will save you watering and weeding all summer. The Neukoms dry farm peaches in Willow Creek using a "dust mulch" from dragging a 6" deep tiller. Straw is cheap, water is expensive, and fruits taste better and more intensely when they have not been watered down with irrigation.

Food Oasis and Food Forests Orchards and gardens can be mixed to make highly productive dense plantings of trees, shrubs, vines, canes, mushrooms and root crops that are managed like an eco-system rather than a traditional orchard. Recently re-popularized by Permaculture proponents, the oldest food forests still in use are 3000+ year old desert oases of interplanted figs, dates, citrus, etc. The indigenous people (e.g. Wiyot, Hoopa) in our region grew food forests with controlled burning to select for nut trees, edible bulbs and young branches for weaving.



"Greengage" Plums
(*Prunus domestica* ssp. *italica* var. *claudiana*)

The "Greengage" is a family of ancient heirloom plums developed in France from Turkish wild types and grown throughout Europe as a choice desert plum, frequently cooked in syrup to make a plum compote. The greenish colored flesh seems to confuse birds and the Greengage escapes being pecked. Richmond Road.



"Golden Nectar" and "Shiro" Plums
(*Prunus salicina*)

The "Golden Nectar" is an early-bearing, bright yellow, famously sweet plum but is not successful every year due to the need for heat. A healthy, mature one was loaded in 2013 on G St, Arcata. The "Shiro" is more dependable, but has smaller plums. A successful grove of them is planted at the Courtyards of Arcata food forest on Guintoli Lane.



"Methley" and "Beauty" Plums
(*Prunus domestica*)

The "Methley" is a new proven sweet success while the "Beauty" is a local standard, smaller, less interesting tasting sweet plum. Potowat Health Village, 12th Street, Buttermilk and Roberts Way, Arcata.



Pineapple Guava
(*Acca sellowiana*)

This Brazilian member of the Myrtaceae family fruits after 10-15 years, but its flower petals are sweet treats while you wait. Hardy named varieties of this tropical tasting fruit are grown as far north as Scotland, but the more-easily available unnamed seedlings may not work in our climate or be helpfully self-fertile. CCAT on HSU's campus and the Potowat Health Village Farm.



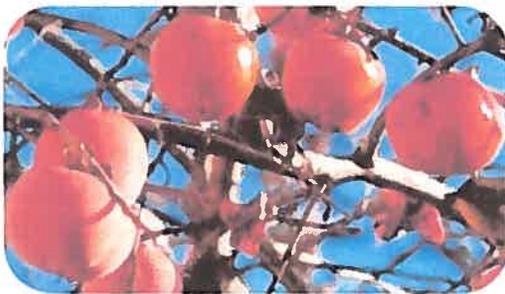
Strawberry Tree
(*Arbutus unedo*)

The relative to madrone is juicy and sweet, but also mushy and rather seedy. The peeling bark and sinuous shapes are reason enough to plant one, but the fruit is fun and one of the first in June. Founders Hall at HSU, parking lots at Eureka Natural Foods and the Arcata Co-op.



"Stanley," "Italian" and "French" Prune Plums (*Prunus sp*)

Disagreements are rife among prune fans as to which is best (French is sweetest...), but all three similar varieties are self-fertile, do well around the Bay and their fruit ripens all at once, requiring the gardener to quickly dry, eat, or give away the plums. Thin the heavily loaded branches so they don't break! Roberts Way and Hilfiker St, Arcata.



Eastern Persimmon
(*Diospyros virginiana*)

The Eastern Persimmon is native to the Northeast and is the only persimmon to fruit fairly well on the Bay. It is astringent like a green banana until gooey ripe, but then tastes like cinnamon custard. Old Arcata Road.



Pepperwood/California Bay Laurel Nuts (*Umbellularia californica*)

This highly aromatic native tree has nuts that can be roasted to a dark chocolate brown color to reduce their pungency, then eaten whole or ground up in a drink. They're a delicacy to those who know about them. Arcata's Redwood Community Forest.



"Damson" Plum
(*Prunus institia*)

The small, heavy-bearing Damson plums have traditionally been used for making wine, brandy jam and jellies. This heirloom subspecies is from the Damascus area of modern-day Syria, and were introduced to England by the Romans two millennia ago. The "spicy" yellow flesh is sweet, but the tart skin is what makes for a complex, interesting wine or jelly.

-Pluots, Seabuckthorn/Seaberry and Avocados have not yet fruited in any of the Humboldt Bay plantings.



Hazelnuts, both native and “Yamhill”
(*Corylus species*)

Former Wiyot Tribal Chair and tribal Elder Cheryl Seidner remembers eating native hazelnuts when she was 12, but not since—the plantings have all but disappeared. Native hazel nuts are lightly productive, while some cultivars will produce moderate numbers of nuts on large shrubs/small trees. Hazelnut trees are excellent for hedges, native plantings, and can handle wind and partial shade. Roberts Way, Arcata.



American Chestnut
(*Castanea dentata*)

Sweet, soft, rich nutmeat is the hallmark of the Chestnut, and worth the effort of peeling. California is outside Chestnut Blight zone, so our Chestnut trees can grow large and old, while most U.S. trees are killed before they can ever fruit. There is a very large, old tree in a yard on Old Arcata Road that drops nuts, and two healthy trees on Main St. outside of Eureka that have not yet fruited since they started from twigs in 1990—usually they take four years, so this is a mystery.



English Walnuts “Pedro” and “Carmelo”
(*Juglans regia*)

It is commonly said that the Bay’s cool climate doesn’t grow walnuts. Not true! “Carmelo” is a tall walnut tree with large nuts, almost double the size of most walnuts. Carmelos are also grown in commercial California orchards. “Pedro” is a 30’ tall semi dwarf walnut variety that grows a relatively small walnut. Both grow and fruit on Old Arcata Road.



“Centennial” Crabapple
(*Malus domestica*)

This personal favorite fruits early, by September 1st in 2012, and flowers on the late side, thus avoiding the rainy shoulders of our dry summer. The Centennial fruits with a lovely blushed set of apples but nary a rubbing scar, so they’re ornamental as well as juicy, bright, complex, sweet and aromatic. You may want to thin the 2” fruits some years because the Centennial can fruit so heavily it breaks its branches. Specimens next to the old Stewart School in the Arcata Heights neighborhood and Foster Ave are loaded.



“Golden Delicious” varieties
(*Malus domestica*)

The “Golden Delicious” is among the most successful varieties around the Bay. **Supreme** and **Sir Prize** are both favored varieties. Golden Delicious apples are sweet, crisp, and profuse, best eaten fresh, juiced or sauced. They do not serve well for pies because the Golden Delicious variety gets wet and sloppy without much tartness or complexity, but consider mixing them with the Red Gravenstein. The fruit ripens in September and is best picked in October and November. It grows sweeter as it hangs on the tree until the flesh becomes translucent with sugars. Foster Ave.



“Red Gravenstein”
(*Malus domestica*)

The popular and successful Red Gravenstein is a firm apple that bursts with complex flavors and perfumes, tart and sweet, so this terrific apple has can be used for eating fresh, pies, sauces and drying. It is also the earliest ripening of coast apples, so consider planting it in a row of apples trees. The Old Arcata Road.



“Liberty”
(*Malus domestica*)

Robust, nearly scab free, sweet and flavorful—the Liberty is a local favorite. Hilfiker St and Roberts Way, Arcata.



“Fuji” and “Granny Smith”
(*Malus domestica*)

Fujis grow smaller and greener close to the Bay. **Granny Smiths** fruits heavily, store well and can be left to sweeten on the tree until February. Loleta and Redmond Rd.





"Scarlet Surprise" Apple
(*Malus domestica*)

One of the reddest of all red-fleshed apples (there are dozens!), this early season apple is tart, berry flavored and juicy. Scarlet Surprise is vigorous and healthy, and the apples should be eaten right away—they don't "keep." This variety was used by Albert Etter to breed the Pink Pearl.



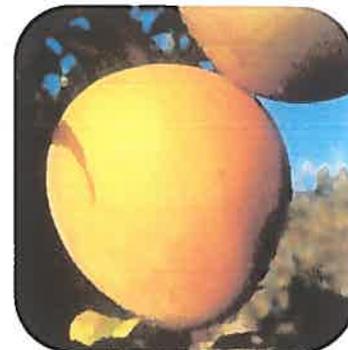
"Pink Pearl" Apple
(*Malus domestica*)

The pink-to-magenta sweet-tart flesh tastes of raspberries and is best fresh but makes an incredibly beautiful sauce. This extraordinary local heirloom has magenta pink flesh and was bred by Albert Etter from Scarlett Surprise near modern-day Ettersville in Southern Humboldt.



"Mountain Rose" Apple
(*Malus domestica*)

The scarlet red flesh of this apple smells like cotton candy and strawberries. The apple is mildly sweet-tart and bright red even when cooked. The rare variety hails from Mount Hood, Oregon.



"Hudson's Golden Gem" Apple
(*Malus domestica*)

This unique and sweet dessert apple was discovered in a thicket in Oregon in 1831. The fruits are large and cone-shaped but the tree itself stays small. Apples should ripen all the way on the tree September. Western Ave and Redmond Rd.



"Mutsu" Apple

The Mutsu is grown commercially at Clendennon Cider works in Fortuna and has done well in Arcata. It's fruit is similar to a Golden Delicious, but larger and tarter.



"Wickson" Crabapple

This sweet eating and cider variety of crabapple was developed by Southern Humboldt apple breeder Albert Etter and named after his mentor Edward Wickson.



"Macintosh" Apple
(*Malus domestica*)

A classic summertime apple, the Macintosh has done well in both Arcata and McKinleyville back yards, producing sweet, crisp apples early in the season. Windsong neighborhood.



"King" Apple (*Malus domestica*)

The "King" Apple is one of the easiest apples to ripen around the Bay. It's a large apple with sweet flavor and a local favorite in commercial orchards. The tree grows vigorously and large. The fruit ripens in August. Old Arcata Road



"Akane" Apple (*Malus domestica*)

Pronounced Ah-Ka-Nay, this is an early season apple with a balance of sweet and sharp flavors that was developed in Japan in the 1930s from the "Jonathan" and "Worcester Pearmain."



"Honeycrisp" Apple
(*Malus domestica*)

A relatively recent and popular variety that is a proven success in the blustery Windsong neighborhood and Deep Seeded Community Farm. Famed for its exceptional sweet-tart flavor for eating out of hand, it also stores fairly well.



"Melrose" Apple
(*Malus domestica*)

The Melrose is the favorite apple of Mary, the fruit tree buyer at Miller Farms. Her tree is heavily productive just blocks from the ocean. Dick LaForge, says: "Good in all ways, medium-late fruits, stores well, no disease and tasty."



"Dolgo" Crabapple
(*Malus dolgo*)

This sweet-tart Siberian variety of crabapple produces crispy small apples good for eating fresh or making into jelly, cider, etc.. The heavy showing of white flowers helps pollinate other apple trees.



“Bartlett” and “Delicious” Pears (*Pyrus communis*)

Few pears ripen without cracking around the Bay, but a green Bartlett pear has thrived and produced nearly scab-free pears for 30 years on 11th St in Arcata, and the related “Delicious” variety is productive on Redmond Road. European pears need well drained soil and cross-pollination.



“Orcas” Pear (*Pyrus communis*)

Orcas pears are mild, sweet and one of the most scab resistant varieties of the Pacific North West. This variety was found in an orchard on Orcas Island, Washington.



“Bosc” Pear (*Pyrus communis*)

A Bosc pear is crunchy and sugary, a favorite for frugivores who love a crisp bite. Their thicker skin makes them the least prone to scab and cracking of the European pears. Windsong and Eye St, Arcata.



“Comice” and “Duchesse d’Angouleme” Pears

The Comice and its close relative, the Duchesse d’Angouleme” are tender to the touch, juicy, sweet and buttery, when ripe. These related pears are both somewhat fireblight resistant, which is helpful around the humid Humboldt Bay.



Medlar (*Mespilus germanica*)

Medlars were popular in Europe around the 12th century, but are mostly a novelty today—apple sauce packaged in its own skin! Medlars are like dates, Hachiya persimmons or jujube berries that shrivel on the tree until soft, or “bletted”, but they can be picked earlier and ripened sepals down on paper. When finished bletting, medlars are brown, soft and taste like caramel, applesauce or cinnamon custard. Medlars produce fruit in just two years and grow so thickly they can be used for topiaries. Plant in full sun and somewhat wind protected. Roberts Way.



“Shinseiki,” “20th Century,” “Hamese,” “Atago” Asian Pears (*Pyrus pyrifolia*)

These four yellow fleshed varieties of Asian Pear that have proven themselves consistent but relatively light bearers. Leave them on the tree until they are swollen and yellowed for best flavor. The trees are vigorous growers and the pears are sweet, juicy, and medium-large if thinned early in the season to allow the remaining pears to grow larger. Hilfiker St, Foster Ave, Roberts Way.



Shipova (*X Sorbopyrus auricularis*)

This cross of European Pear and a Mountain Ash fruited after growing for seven years, and was worth the wait. It tastes like Asian Pear and is wet and meaty. It may fruit better if planted with a pear for cross-pollination. Roberts Way.



“Kaunching” Quince (*Cydonia oblonga*)

Many types of Quince grow well on the Bay, but unlike most the Kaunching variety can be eaten raw, rather cooked with apples and pears into a lovely sauce. Quince also do well in aples pies, can be made into a cheese-like custard and even a fruity liqueur. A productive example can be found at C St & 12th near HSU, Kaunching is on Foster Ave, Arcata.

Apples That Have a Mixed Record of Success

Gala: Performed well in a sheltered back yard on 11th and O St, but scabby and really bad results on Old Arcata Road in a very exposed location. A Galarina type may be more successful.

Waltana: An Albert Etter variety that has not done well on Hilfiker in the Arcata Bottoms.

There are many other local varieties developed by Albert Etter, of Ettersberg, CA between the late 1800s and his death in 1950. His Southern Humboldt nursery produced patented varieties that may be worth trying in our colder, wetter microclimate, such as the Jonwin, Humboldt Crab, and Crimson Gold Crab.

Shrubs



“Patriot” and “Blue Crop” Blueberries
(*Vaccinium ssp*)

All blueberry varieties listed below thrive around Humboldt Bay and fruit well with irrigation but may struggle for the first years without irrigation. There are many species of plants called blueberries from all over the world, some of which are evergreen, some deciduous. Foster Ave, Eastern, Spear Ave, Arcata

- | | | | |
|-------------|----------------|----------------|---------|
| -Blue Crop* | -Patriot* | -Burgundy | -Elliot |
| -Brigitta | -Chandler | -Duke | -Darrow |
| -Blue Gold | -Blue Ray | -Hardy Blue | -Reka |
| -Rubel | -Sunshine Blue | -Legacy | -Misty |
| -Brunswick | -Top Hat | -Pink Lemonade | |

***Overall favorites**

Notable Failures: “Rabbits Eye” varieties, Camellia and Spartan



Huckleberries (*Vaccinium parvifolium, V. ovatum, others*)

Tart-sweet, slightly astringent black and red huckleberries are native to Humboldt Bay and perfect for native gardens. Natives and cultivars of the closely related species do very well in 3/4ths sun with abundant, small, intensely flavored berries. Black and blue species bear more heavily than the milder tasting red huckleberries. Ma-le’l Dunes, Western Ave, former CCAT native gardens and Roberts Way.



Aronia (*Aronia melanocarpa*)

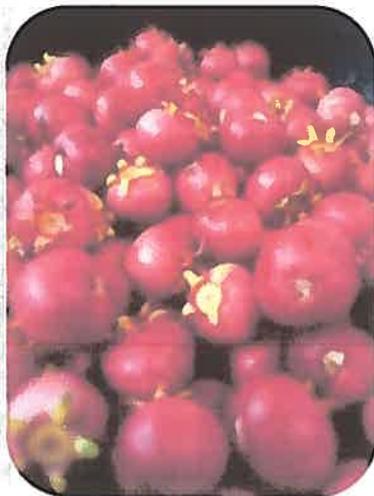
Aronia is a productive fruiter, with fruits that can be astringent or rich and sweet-tart, depending on ripeness. The pulp has a complex flavor, having been described as a mixture of pear, pomegranate and blueberry. The dark purple skin has extremely high levels of antioxidants, especially anthocyanins, known to help reduce cellular damage from free radicals. Very hardy. Foster Ave.



“Sweet Scarlet” and “Red Gem” Goumi Berry

(*Eleagnus multiflora*)

Goumis are one of the earliest fruits of the season in May and are hugely popular with little children. They are from coastal China, Korea and Japan with cherry-like and sweet-tart berries that can be enjoyed fresh, and are excellent cooked. The seeds are thin and swallowable. Sweet Scarlet grows vigorously puts on a heavy fruiting in the Bay Bottoms. The shrub fixes nitrogen for your garden with actinomycete bacteria living in symbiosis within its roots. Goumi berries and seeds are a rich source of Lycopene, essential fatty acids, proteins and fats. Astringent until ripe, more fertile in pairs. Do not buy non-varietal seedlings, which are invasive. Foster Ave & Roberts Way.



Chilean Guava
(*Myrtus ugni molinae*)

The Chilean Guava is very popular in South America, and they are the only species of guava that is known to fruit in Arcata. They are ripe when the red berries lighten to pink and the taste is pleasantly piney and guava-ey. Chilean Guava is evergreen, attractive, easy to propagate and can handle fog, while also providing some of the last fruits of the fall. Roberts Way and Janes Creek Meadows subdivision of Arcata.



Arrayan/Chilean Myrtle/Luma (*Myrtus apiculata*)

Arrayan, or Luma Tree, is a large shrub or a small tree with berries that are milder and juicier than its smaller cousin, the Chilean Guava. It has been sold in California since 1909. Very hardy and can be grown as a fruiting hedge with huckleberries. 101 Corridor in South Eureka near the Bay.



Jostaberry

(Ribes nigra x R. divaricatum x R. uva-crispa)

The Jostaberry is a highly recommended sweet-tart cross of black currant and two types of gooseberries. It's a large shrub with early July berries and no thorns, perfect for small children. It is also somewhat resistant to the currant worm. Foster Ave, Roberts Way, Arcata.



Red Currant

(Ribes rubrum)

The juicy red berries are sour but tasty in a syrup or jelly. Unfortunately a "recurrent" problem is sawfly larvae called "currant worm", which usually arrives to eat your bush to the stem midribs within 2-3 years after planting. Nicotine has worked to control the currant worm, as does pyrethrin-based organic insecticide, but note that *Bacillus thuringiensis* does not work on sawflies. CCAT, Roberts Way and Western Ave.



"Pixwell" and "Hinnomaki Yellow" Gooseberries *(Ribes uva-crispa)*

Gooseberries are an old European fruit that succeed along the Atlantic coast from France through Scandanavia. In our area, "Pixwell" is the best, followed by "Hinnomaki Yellow," which may prefer more heat to sugar up. "Red Hinnomaki" is on trial, but "Poorman" has been eaten to the midribs by sawfly larvae. Foster Ave, Roberts Way.



Service Berry/Saskatoon/Juneberry, "Smokey" *(Amelanchier alnifolia)*

Although this native tart, soft berry looks like a blueberry, it tastes like the delicate pear it is more closely related to. The fruit is called serviceberry because it blooms in mid-April, when long-delayed religious services were held throughout 19th century New England. It is called the juneberry because the fruit ripens in June. Berries have twice the anti-oxidants as blueberries. Roberts Way.



Clove Currant

(Ribes odoratum)

Around the Bay the best tasting currant that is also resistant to the sawfly larvae is the black Clove Currant, which has bright red and green foliage, is modestly productive and best eaten when almost overripe. It does suffer from a wilting disease that can harm half the harvest. It grows large without pruning and has fragrant flowers. The related Jostaberry is somewhat resistant to the currant worm, and the Pixwell currant has a little resistance. Roberts Way, Foster Ave.

July 17, 1858 "Lewis K. Wood, an ex-county clerk, appears to be as apt at farming as he was at keeping correct records. He is the owner & occupant of the Kiwalettah Ranch [now 1387 Janes Road] & has some of the finest fruits in this vicinity. He sent us some currants & gooseberries yesterday, which are the largest we have seen on this Bay. Receive our thanks, friend Lewis." From the Fountain Papers



Red Flowering Currant *(Ribes sanguineum)*

The native red flowering currant is popular with our native hummingbirds and is a gorgeous landscaping plant, but the marginally edible fruit will likely stay on the bush to support native wildlife. Marsh Commons, Foster Ave.

May 12 -1855 - Kiwellattah "The person, who when passing through this farm, has been in the habit of jerking the latches off the gates and otherwise leaving them open, will have the moral courage to let his name be known and give his reasons for so doing unless too low flung and cowardly to do so, in which case I only want to catch him at it." LK Wood's public posting from the Fountain Papers



Lingonberry

(Vaccinium vitis-idaea)

These tart red berries grow on low, evergreen shrubs throughout Scandinavia's forests and are smaller and juicier than their similar relative, the cranberry. No fruits in a McKinleyville garden, but more success on Roberts Way, Arcata.



Fuchsia berries
(*Fuchsia splendens* and others)

Fuchsia species have surprisingly sweet juicy berries, although sometimes peppery. Roberts Way, Foster Ave.



Chilean Wintergreen (*Gaultheria mucronata*)

This species grows throughout South America and is highly variable, with pleasant, juicy and wintergreen-tasting purple to pink to snow white berries on bushes 1-5' tall.



Wintergreen
(*Gaultheria procumbens*)

This lovely evergreen groundcover fruits in late fall and winter. The small red foamy berries and evergreen leaves can be used to make a minty tea. Good for sinus and respiratory health. Foster Ave and Luscious Gardens, McKinleyville.



Native Blue and "Adams" Elderberry (*Sambucus nigra* L. ssp. *Caerulea* and *Sambucus canadensis*)

The native Blue Elderberry is sweet, as is the European "Adams" elderberry. These elderberries are sweet enough for wine. "Adams" will fruit better with a cross-pollinating variety such as "Black Lace," which has gorgeous purple foliage and a modest amount of fruit. Local forests as well as Roberts Way and the Greenway Building Gardens.



Saltspray Rose
(*Rosa rugosa*)

Extremely hardy, vigorous, disease-free rose will form a thicket if left unchecked. Huge sweet/tart and mushy rosehips form after fragrant blooms on young canes, good for eating fresh or making into jam, wine, etc. Rose petals are edible.



Cranberries
(*Vaccinium macrocarpon*)

Cranberries grow successfully in sunny Blue Lake and want a warm spot in your Bay region garden. Almost every genus of *Vaccinium* does well in our climate (blueberries, huckleberries, lingonberries), but cranberries especially need irrigation and warmth.

Vines and Canes



"Blake", "Hayward" and "Vincent" Fuzzy Kiwi
(*Actinidia deliciosa*)

Small and sweet kiwis are available around the Bay, and the "Blake," "Hayward" and "Vincent" varieties have proven themselves. Kiwis grow vines big enough to swallow a house and must be pruned to keep them under control. They are a sexed plant, so a male and a female are necessary for fruit. However, hand pollination is easy if your friend has a male in blossom and you have a female. CCAT, Foster Ave, Roberts Way.



"Blue Moon", "Blue Forest" and "Blue Pacific" Honeyberry
(*Lonicera caerulea*)

Honeyberries are a type of honeysuckle shrub that has been bred into different edible varieties. Around the Bay they are juicy and tart, not "honey", and the leaves can be afflicted with caterpillars. "Blue Moon" is the better tasting variety. Roberts Way.

* Notable Shrub Failures

- Goji berries grow inland but will not flower or fruit in the cold summers on the Bay
- Highbush Cranberries will fruit terrible "butyric" tasting berries
- Bush cherries get confused by false spring weather and consistently suffer from brown rot



"Muscat of Alexandria"
(*Vitis vinifera*)

There are 200 varieties of Muscat grapes, which are perhaps the oldest family of domesticated grapes. They have sweet and exotic flavors that makes them a favorite for table grapes and in desert wines. Very successful on Q St and Foster Ave, Arcata



"Einset"
(*Vitis labrusca*)

A medium sized seedless table grapes famous for tasting like strawberries. Prefers to grow on longer canes. Growing in a wind protected garden near Wildberries.



"Interlaken"
(*Vitis labrusca*)

A seedless table grape that is good fresh or as raisins. Vigorous, disease resistant vines. Developed from the same parents as Himrod, although Interlaken may have higher yields and ripen earlier. Near Wildberries.



"Vanessa"
(*Vitis labrusca*)

A sweet, firm and extremely cold hardy seedless grape that stores well. The flavor is bright and mild. Near Wildberries.



"Himrod"
(*Vitis labrusca*)

Himrod is a seedless green grape known for excellent flavor and ripening early. It has a fast growth rate and is known as one of the hardiest green grapes. Near Wildberries.



"Venus"
(*Vitis labrusca*)

Venus has unusually large grapes for a seedless variety. The skin may be somewhat astringent, but it is well known for being a table grape and sweet wine grape. Near Wildberries.



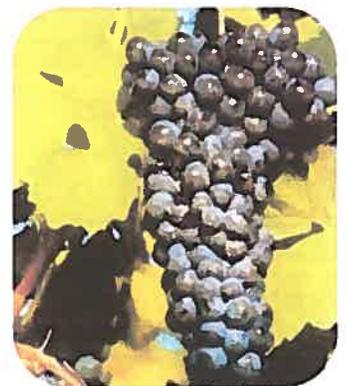
"Marechal Foch"
(*Vitis ripara x Vitis rupestris*)

An early ripening small red wine grape that is disease resistant, very cold-hardy and has a semi-trailing growth habit. It is grown in Southern Ontario, Minnesota and much of the NE and NW of the U.S. Near Wildberries.



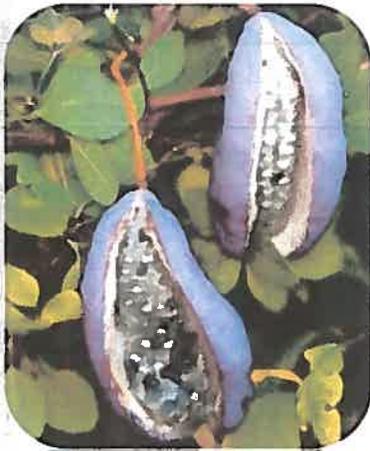
"Hero" Russian Arctic Kiwi
(*Actinidia arguta*)

Arctic kiwis are a large family of related vines, and the "Hero" variety has proven to be a successful variety in Arcata, with sweet and flavorful berries growing on a fence in mixed shade and sun. They are slow-growing in our area due to the cool summers, but are invasive in the forests of Massachusetts. Roberts Way.



"Barbera" Grapes
(*Vitis vinifera*)

It seems nearly impossible to ripen grapes in the blustery Bottoms next to the Humboldt Bay, but the 800 year old Italian varietal called Barbera makes occasional bumper crops on the Bottoms. It was the third most planted variety in 2000 because in Italy it produces flavorful, young red wines. Roberts Way. 12



Chocolate Vine
(*Akebia quinata*)

This beautiful, healthy vine produces lovely and unusual fragrant flowers that result in bizarre purple fruit. Very little of the fruit is edible—just the goo around the seeds tastes custardy and mildly sweet, while the rest of the fruit is bitter. The plant is a vigorous trellis-vine, even in partial shade, and regrows after hard frosts. Needs cross pollination. Roberts Way.



“Maypop” Passionflower fruit
(*Passiflora incarnata*)

Maypops are a type of passionfruit/lilouqui native to the East Coast with tart, exotic flavored gelatinous flesh around the seeds in a yellow-green ball shaped fruit. The maypop must have cross-pollination to produce fruit. The maypop dies back with winter frosts and grows new vines each spring. Janes, K St and Zehdner in Arcata.



Chocolate Berry/Himalayan Honeysuckle (*Leycesteria formosa*)

Chocolate berries are pungent, tasting just like bitter dark chocolate mixed with red wine. They grow into a modest bush and fruit prolifically. This honeysuckle species is from the Himalayan mountains. Foster Ave.

Common Fruit Pests



-“Cherry slugs” are actually sawfly larvae covered in slime. They are not affected by Bt bacteria, but die if sprayed with NEEM or “Safer Soap” mixed with pyrethrins.



-“Currant worms” are also sawfly larvae and have no response to Bt. Manual removal is very difficult, but NEEM or “Safer Soap” mixed with pyrethrins works.



-The Spotted Fruit Fly arrived in CA in 2008, and is a serious pest to all soft fleshed fruits. Eat fruit punctually or it will turn into goop with fruit fly larvae.



“Cascade”, “Willamette” and “Shasta” Hops
(*Humulus lupulus*)

Cascades and Shasta provide medium-sized buds and heavier yields, while Willamette has a lighter yield of very large buds. This beloved bud of beer brewers grows surprisingly well around the Bay. The dried flowers, “hops,” are used to flavor beer and some teas, and the vine does double-duty as decorative greenery. Janes Road, CCAT gardens, Bayside, Roberts Way.



“707 Headband” & “Northern Lights” Cannabis (*Cannabis indica x C. sativa*)

Growing marijuana indoors accounts for 5% of California’s electricity use and associated pollution, while growing outdoors on the Bay is possible with 707 Headband, a cross of Sour Diesel, OG Kush and Master Kush, while Northern Lights is a “pure” variety of *C. indica* that was a parent to the Sour Diesel variety. Grown outdoors and organically on Stewart Ave and Tilley Court in Arcata.



Salmonberry
(*Rubus spectabilis*)

Salmonberry is a native that will grow to 10+’ in dappled shade, but it is a sparse fruit producer and its berries are mild. Found in sunny patches of local Redwood forest groves.

Thimbleberry
(*Rubus parviflorus*)

Thimbleberry is a native raspberry that will grow to 8+’ in dappled shade. It has tart, brightly flavorful berries that ripen best in dappled light, such as in the understory of the Arcata Community Forest and along the Eel River. Lee Ann Dulco, a local Wiyot elder, makes the most incredible thimbleberry jam with berries she collects with her father—they have tiny seeds and huge raspberry flavor.





California Blackberry
(*Rubus ursinus*)

Our native California Blackberries fruit in the Dunes in July, a month or more before the invasive Himalaya blackberries. The native berry is distinctly more flavorful, making a fruitier jam and a more enjoyable handful. Unfortunately they can be light bearers for the amount of thicket they create, and they require direct sun to sweeten up. Natural thickets with enough berries to make it worth your while are found on the North Jetty near the airport/drag strip.



"Albion," "Seascape," "Hood Junebearing," "Tristar," & "Chandler" Strawberries
(*Fragaria x ananassa*)

Many different varieties of garden strawberries will grow around the Bay, but local strawberry farmers say Albion is most resistant to the Spotted Fruit Fly larvae. Seascape and Chandler are large and productive. Gardeners appreciate the flavors of Tristar and Hood Junebearing. They do very well with straw bedding to keep down weeds, prevent berry rot and deter slugs. Rice straw is high in silica and resists rot best in our climate.



Triple Crown Thornless Blackberry
(*Rubus ideaus*)

The Triple Crown Thornless is a superb berry—named for its three pre-eminent traits: flavor, productivity and vigor. It will give you fresh berries for a month straight. If you have room for only one blackberry, this is a great choice. The berries are enormous, and sweet. Foster Ave.



Raspberries
(*Rubus ideaus*)

Many raspberry varieties, both yellow and red, are successful around the Bay. They prefer to be mowed down every year or two so the roots can grow healthy new stems. Raspberry fruits are wonderful and their leaves make an excellent tea. Do not mulch with pine or you will introduce a deadly virus to your raspberries.



Loganberry
(*Rubus x loganobaccus*)

Loganberries are a hybrid of particularly flavorful blackberries and raspberries accidentally created in 1883 by a Santa Cruz lawyer. They ripen early and set large numbers of berries that are not ripe until purple. Loganberries are sweet enough to enjoy off the bush and can replace blackberries and raspberries in jam and pie recipes.



Boysenberry, var. "Nectar Berry"
(*Rubus spp x*)

Boysenberries were developed accidentally in California through multiple crosses, but became a national best-seller for their plump, juicy, complex flavor. Boysenberries are tart on the Bay, but the "Nectar Berry" variety is better suited to our cool summers. Foster Ave and Western Ave.



Marionberry
(*Rubus L. subgenus Rubus*)

The marionberry is our most productive berry on long, heavily fruit laden canes. They are perfect for trellises and training on fences or the side of your house. The berries are sour until almost overripe—they're best in smoothies or cooked in pies and preserves. Foster Ave and Roberts Way.



Tayberry
(*Rubus fruticosus x ideaus*)

Many local gardeners think Tayberries are the very best kind of Rubus berry (blackberry, raspberry, etc.) that grows on the Bay. Tayberries are a boysenberry/raspberry cross, highly productive, disease resistant, lovely tasting, and easily trained to trellises or propped up with wires. The canes can grow 9' 14' long, so give them space. Foster Ave & Tilley Court.



Beach Strawberry
(*Fragaria chiloensis*)

The native beach strawberry of the Humboldt Bay is one of the two species of strawberry that were hybridized to make domesticated strawberries. The fruit is small and sweet, while the plant spreads vigorously with runners that can make a thick and attractive ground cover.



Panther Lily (*Lilium pardianum*)
and

Columbia Lily (*Lilium columbiana*)

The Panther Lily likes moist soil and is found only in California. Its edible bulbs have been harvested by indigenous people for millennia, and it was much more common in years past. The orange with red-speckles Columbia Lily can be harvested for both its delicate petals and edible bulbs, which are peppery and somewhat bitter.



Soap Root
(*Chlorogalum pomeridianum*)

This fibrous native has numerous medicinal uses and was traditionally used as soap, with the outside fibers bundled to make a scrubby brush—supper, soap and scrubber all in one. It is unpalatable unless roasted like a potato, but it is still very fibrous. The flowers are fragrant in the evening to attract moths.

Brodiaea californica leptandra
and
Tritelia laxa



The natives Brodiaea at left and Tritelia at right are small lily-like flowers with abundant and edible bulbs that were a main ingredient in pre-Settlement indigenous meals, and now a valued but rare ingredient in traditional meals.



Fungus and Bulbs: Fruits of the Earth



Blewits (*Clitocybe nuda*)

Blewits are delicious, colorful and like to eat fresh lawn clippings. They were planted in a garden bed heavily mulched with wood chips, but popped up in the lawn 20' away. Tasty and fragrant. Local culinary mushroom expert Bradley Thompson has a 20% success rate of "planting" mushrooms in his garden in layers of wood chips and green waste. Foster Ave.



Wavy Caps
(*Psilocybe cyanescens*)

These edible hallucinogenic mushrooms have purple spore prints and bruise blue after a minute when the stem or cap is squished. There are many look-alikes that do not have purple spore prints and blue bruising. They can be grown in the pathway and mulching around fruit trees on fresh wood chips, except redwood which does not support their growth.



King Stropharia
(*Stropharia rugosoannulata*)

Stropharia were historically grown with corn in Europe because they supported corn health with their habit of eating nematodes (microscopic worms). They can grow large and meaty, and like most mushrooms they taste delicious fried in butter and garlic. Roberts Way, Fungaia Farms on Old Arcata Rd.

Tomatoes (*Solanum lycopersicum*)

The essential thing to know about growing tomatoes around the Bay is that they should ripen in less than 70 days, and give them space to get air movement to dry off after fog or rare summer rain. Sadly, extended wet and cold growing conditions will kill the entire tomato plant.

All tomatoes that ripen fruits within 55-70 days are good candidates around the Bay. Some smaller and cold-hardy varieties that have done well include:

San Francisco Fog* - firm, **best tasting** saladette
Mountain Princess* - **fastest ripening** slicer, compact and productive growth, very little flavor
Mountain Magic* --saladette
Stupice* - saladette
Cherry Tomatoes*—all varieties
Moscovich* - a big slicer with little taste
Early Girl* (DNA patented by Monsanto)--slicer
Oregon Spring - slicer
Principe Borghese-small tomatoes for drying
Siberian - saladette
Siletz - slicer
Sub Arctic Plenty - saladette
Thessaloniki - saladette
Willamette - slicer
Alaskan Fancy - paste
Crimson Sprinter - saladette
Glacier - saladette
Legend - slicer
Marmande - saladette
Matina - saladette

***Most successful varieties**

Hot Weather Annuals



Red Rocoto Pepper
(*Capsicum pubescens*)

This rare Peruvian heirloom is the only pepper that will turn red and gain heat on the Bay. It also called the Tree Pepper. It's lovely, with hairy purple leaves that can cause blisters(!) and 1" hot peppers. This variety is from the cool Andes mountains and likes a long, cool growing season like ours. Unfortunately hot weather is required for colored Bell peppers. Around the cool Humboldt Bay you can grow green peppers, just green peppers, regardless of what the seed package promises. Red Rocotto is on Mad River Road, Foster Ave



"San Francisco Fog"



"Georgia Jet"

**"Georgia Jet" and
"Beauregard"
Sweet Potatoes**
(*Ipomoea batatas*)

These two varieties of sweet potatoes are highly productive and among the fastest to harvest with 80-90 days of "normal" summer in the Northeast, but on the Bay we have less than 70 days of growing time so they produce light harvests. They are also especially favored by gophers. Mad River Hospital.



**"Golden Bantam," "Spring Treat"
and "Sugar Dot"**
(*Zea mays*)

The three varieties of sweet corn that produce at all still have modest harvests on a good year due to lack of spring ground heat and summer ripening heat. The Golden Bantam at left is a genuine heirloom, the corn that started the yellow sweet corn craze in 1902 when it came out in the Burpee catalogue. Spring Treat (not pictured) looks like Golden Bantam, but is a hybrid seed. The bicolor hybrid Sugar Dots at right is noted for starting "vigorously" in cool soils like ours. A few varieties of feed corn and decorative corn will grow small ears, but according to Paul Giuntoli, a 4th generation Bottoms farmer, "the others just give a pretty stalk." Bottoms farms and the Mad River Hospital farm.



'Mini' Apple Orchard Systems Trial: A Comparison of Central-leader, Vertical-axis, and Tall-spindle Apple Orchard Systems on Three Different Rootstocks

Jon Clements

Center for Agriculture, University of Massachusetts

Introduction

When planting a new apple orchard in Massachusetts or the region, growers are faced with an important decision – which apple orchard system to plant? Currently, there are three logical choices. The central-leader (CL), planted on semi-dwarf rootstocks including M.7, MM.106, and G.30 (among others). Tree density is about 300 trees per acre and trees are generally not supported. Trickle irrigation is optional. The vertical-axis (VA), planted on vigorous dwarf and smaller semi-dwarf rootstocks such as M.9 (vigorous clones), G.16, M.26, and G.30 (among others). Trees are typically supported with a metal conduit at each tree tied to a single (high) wire and tree density is about 600 trees per acre. Trickle irrigation is highly recommended. The tall-spindle (TS), becoming increasingly popular, is a high-density planting system using dwarf rootstocks such as M.9, B.9, G.11, and G.41 (among others). Trickle irrigation is mandatory and tree density is high, ranging from 1000 to 1200 trees per acre.

Materials & Methods

To help growers answer this question, in 2006 a 0.5-acre 'mini'-apple orchard systems research and demonstration orchard was planted at the UMass Cold Spring Orchard, Belchertown, MA, with the objective of comparing the three systems in terms of establishment cost, management, and productivity. The orchard was planted with two cultivars, McIntosh (Snappy Mac or Rogers) and Honeycrisp and three tree spacing/rootstock/systems as detailed in Table 1.

The systems trial was planted in an experimental design with three replications. There were a total of nine rows, each row comprised of one system with each cultivar (McIntosh or Honeycrisp). For CL, there were five trees per cultivar per row (30 trees total); for VA, 7 trees (52 trees total); and for TS, 13 trees (78 trees total). Trickle irrigation was installed on all trees.

No data were collected on establishment and maintenance cost(s), since the cost of establishing such orchards has been documented elsewhere. When talking

Table 1. 'Mini'-apple orchard systems trial training system details.

Training system	Rootstock	Tree support	Tree spacing (in-row x between-row)	Density (no. trees/acre)
Central-leader	MM.106	No	10 x 15	290
Vertical-axis	M.26	Yes	6 x 14	520
Tall-spindle	B.9	Yes	3 x 12	1200

with growers about the cost of establishing an orchard, I typically use a figure of \$10 per tree multiplied by the number of trees per acre. The cost of trees is the overriding factor. Therefore, it is assumed the approximate cost per acre for establishing these three orchards is: CL, \$2,900; VA, \$5,200; and TS, \$12,000. Ongoing maintenance and harvest costs generally increase as tree density increases (tree training and per-bushel harvest costs), however, the difference between orchard systems is not significant and beyond the scope of this study. In the early years, the high-density systems will take more time, but later, they become more labor-efficient than the lower-density orchards.

Additional data collection has been minimal, consisting of yield beginning in 2008 (3rd leaf) and continuing in 2009 and 2010. Two methods were used for estimating yield per acre: in 2008, all fruit on each tree were counted after ‘June drop’ in mid-July, and assumed to average 100-count fruit per 40 pound box (0.4 pounds per fruit) at harvest in September. In 2009 and 2010, all fruit were picked and either weighed (2009) or put in bushel boxes or bins (2010) and total yield recorded.

Results

Comparing Honeycrisp to McIntosh only (Table

2), Honeycrisp yielded more apples per acre in 2008; however, McIntosh yielded more in 2010. In 2009, they yielded the same. Cumulative yield was higher for McIntosh than Honeycrisp.

Looking at rootstocks (i.e., system: TS, VA, or CL) only (Table 3), B.9 produced the highest yield per acre for all three years. M.26 and MM.106 did not differ in yield during the individual years; however, M.26 produced higher cumulative yield than MM.106. Remember that rootstock is confounded with system, i.e., B.9 is tall-spindle (TS), M.26 is vertical-axis (VA), and MM.106 is central-leader (CL). Therefore the tall-spindle system had the highest yield per acre across-the-board.

Table 4 shows yield per acre by cultivar/rootstock (planting system) combination. In general, yield per acre did not differ by cultivar/rootstock combination except as described above for cultivar and rootstock individually. But, in 2010, yield of McIntosh/B.9 was significantly higher than Honeycrisp/B.9 (Figure 1). The same was true for cumulative yield (Figure 2).

Conclusion

Overall, regardless of cultivar, the tall-spindle (TS) system planted on B.9 rootstock (Figure 3) had the highest cumulative yield of fruit during the 3rd, 4th, and

Table 2. Apple yield (40-lb boxes/acre) by cultivar and year.

Cultivar	2008	2009	2010	Cumulative (2008-10)
Honeycrisp	111 a	138	582 b	831 b
McIntosh	55 b	238	777 a	1070 a

Cultivars within year not followed by same letter are significantly different.

Table 3. Apple yield (40-lb boxes/acre) by rootstock and year.

Rootstock	2008	2009	2010	Cumulative (2008-10)
B.9 (TS)	140 a	350 a	1061 a	1551 a
M.26 (VA)	79 b	121 b	596 b	796 b
MM.106 (CL)	29 b	93 b	382 b	504 c

Rootstocks within year not followed by same letter are significantly different.

Table 4. Apple yield (40-lb boxes/acre) by cultivar/rootstock and year.

Cultivar/rootstock	2008	2009	2010	Cumulative (2008-10)
Honeycrisp/B.9 (TS)	176	288	738	1202
Honeycrisp/M.26 (VA)	109	55	619	783
Honeycrisp/MM.106 (CL)	47	71	390	508
McIntosh/B.9 (TS)	105	412	1385	1902
McIntosh/M.26 (VA)	49	187	574	810
McIntosh/MM.106 (CL)	11	115	373	499

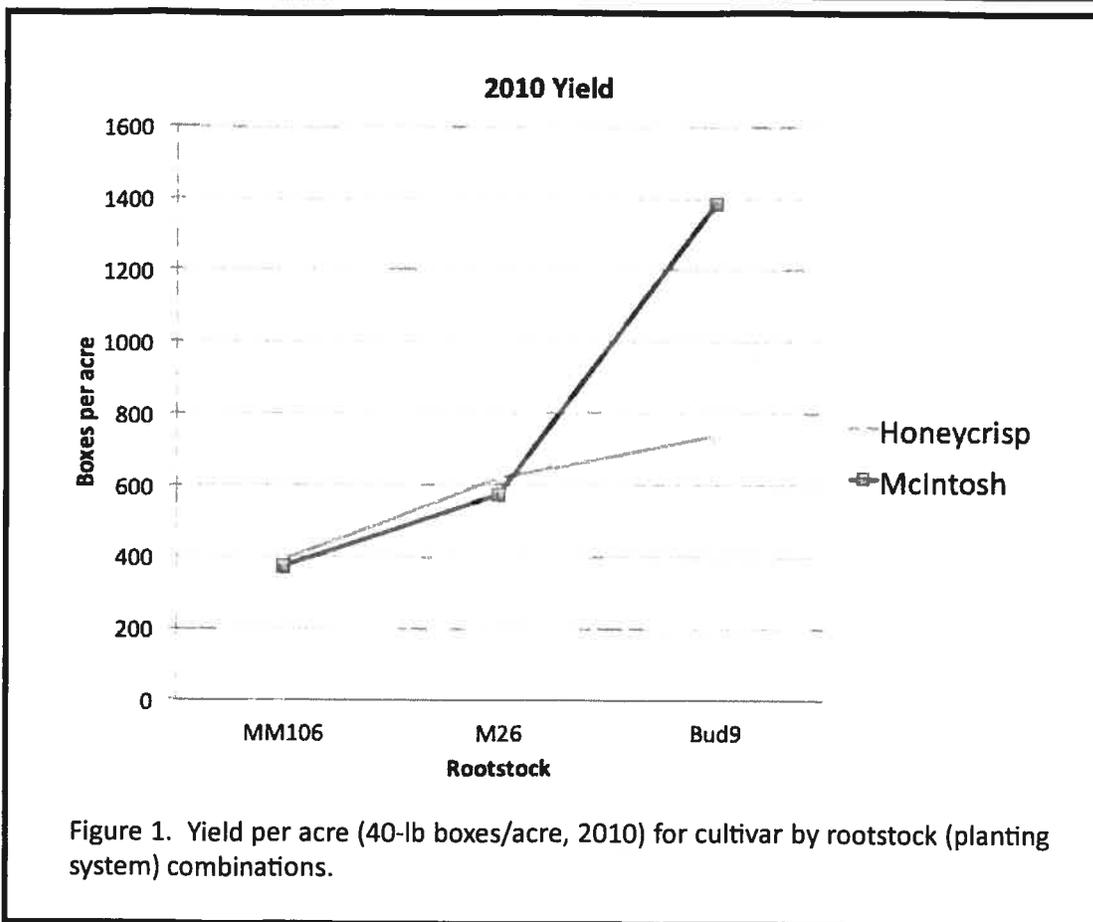


Figure 1. Yield per acre (40-lb boxes/acre, 2010) for cultivar by rootstock (planting system) combinations.

5th seasons. In fact, cumulative yield was almost twice that of the vertical-axis system (Figure 4).

Now, let us consider the estimated economics briefly by looking at estimated cost of establishment, cumulative yield at the end of the 5th leaf, and estimated gross return from the harvested apples, assuming a retail price of \$40 per box (Table 5).

Now, admittedly this economic analysis assumes

that fixed and variable operating costs per acre per year are the same, which is probably not altogether true, although I would contend it is not going to make a big difference in the final conclusion of this economic analysis. It also assumes that all of the yield is sold as top-quality fruit at retail.

Although the cost of establishing the tall-spindle orchard seems high, the potential to make considerably

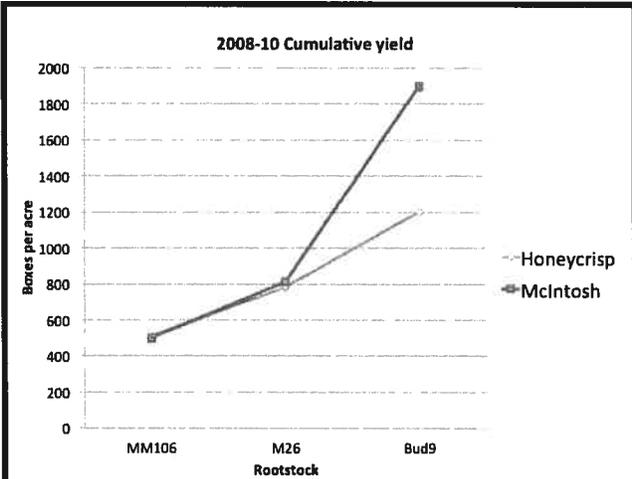


Figure 2. Cumulative yield (40-lb boxes/acre, 2008-10) for cultivar by rootstock (planting system) combinations.



Figure 3. Tall-spindle Honeycrisp apple tree on B.9 rootstock, September 2010.

more money in the early years and recover that return on investment is very high, assuming all goes well. This is why the number one proponent of the tall-spindle orchard in North America, Dr. Terence Robinson of Cornell University, is often espousing the tall-spindle apple orchard as “the way to fabulous riches” (Figure 5) for the progressive apple grower.

Thanks to the Trustees of the Horticultural Research Center for the financial support to establish this research and demonstration planting and the staff of the UMass Cold Spring Orchard Research & Education Center for harvest help.

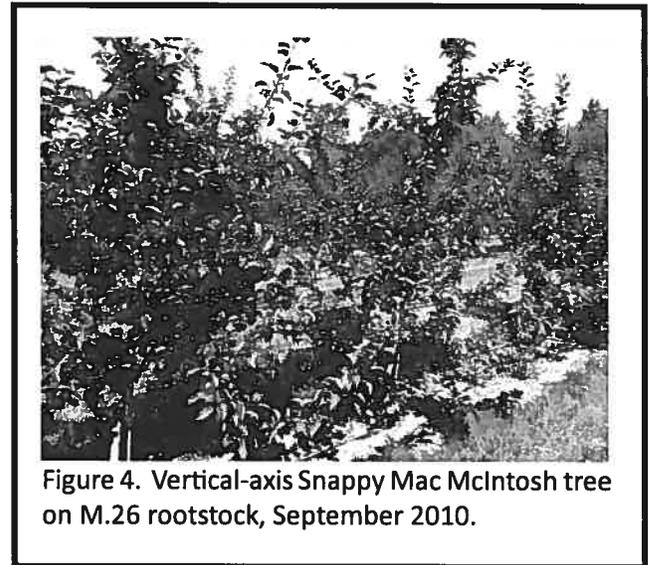


Figure 4. Vertical-axis Snappy Mac McIntosh tree on M.26 rootstock, September 2010.

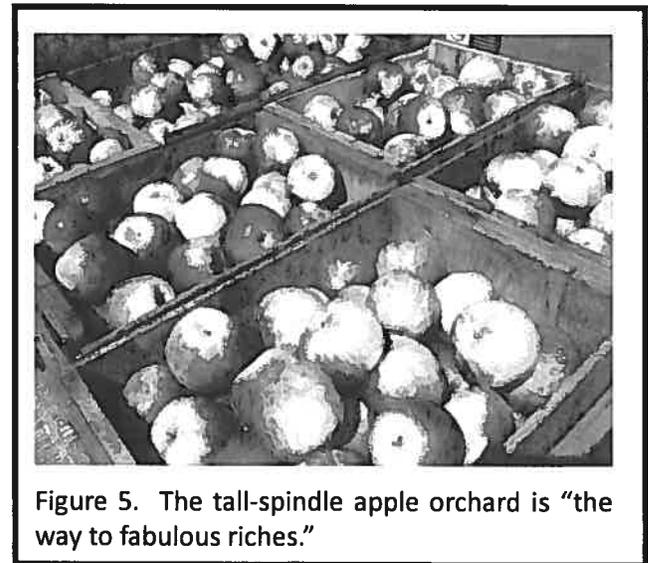


Figure 5. The tall-spindle apple orchard is “the way to fabulous riches.”

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The Problem: What System to Plant?

- There is great disparity of opinion on the optimum planting density.
- Some growers plant 200-300 trees/acre on semi-dwarfing rootstocks with Central Leader.
- Most growers plant 500-1000 trees/acre on dwarfing rootstocks with some version of Vertical Axis.
- A few growers plant 2000 trees/acre on dwarfing rootstocks with Super Spindle.

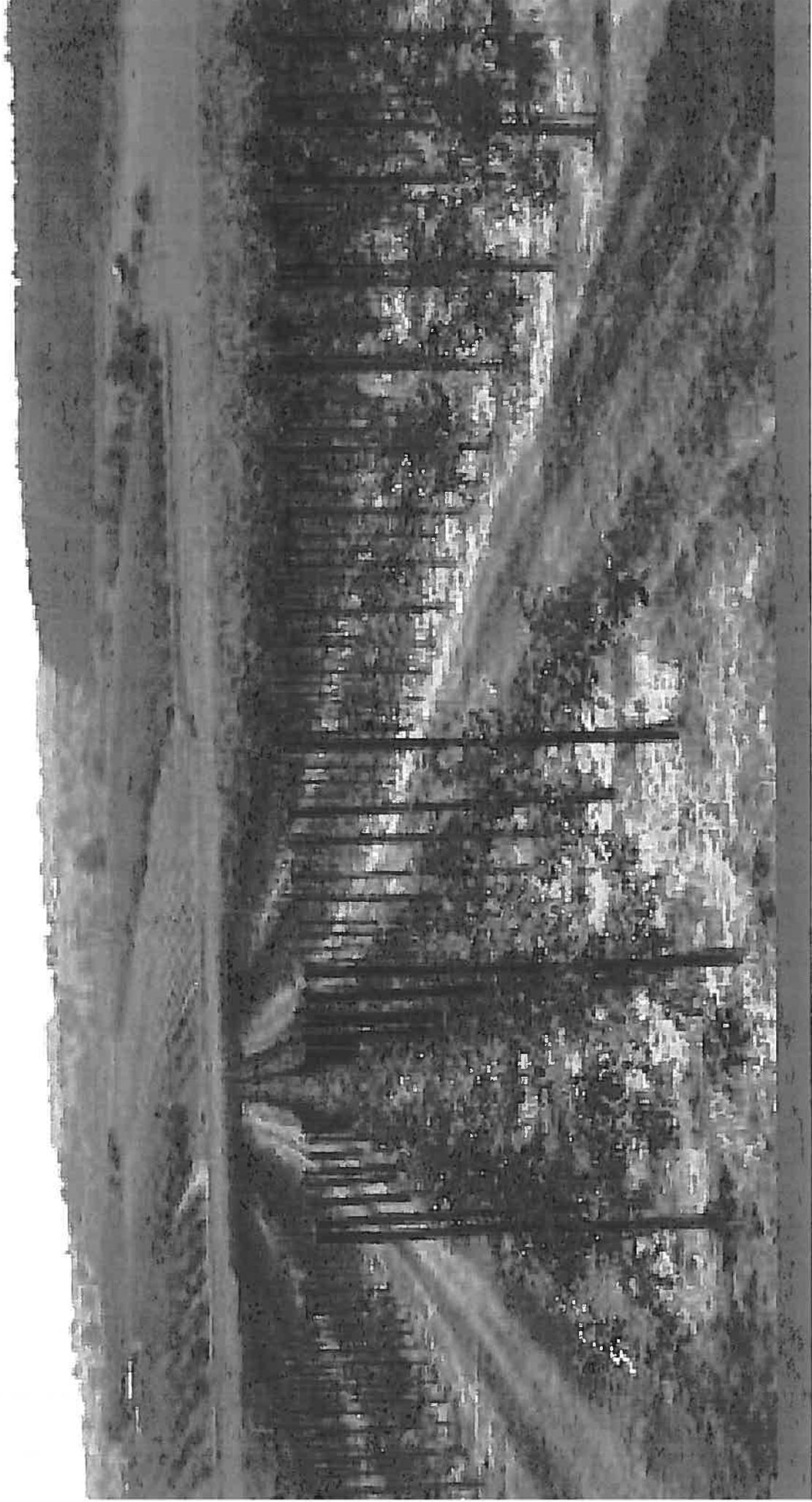
Viable Orchard Systems in NY

System	Tree Density (trees/acre)	(trees/ha)	Spacing (ft.)	Rootstocks
• Slender Pyramid	340	840	8' x 16'	M.26, G.30, G.935
• Vertical Axis	622	1538	5' x 14'	M.9, G.41, G.11
• Slender Axis	908	2244	4' x 12'	M.9, G.41, G.11
• Tall Spindle	1320	3262	3' x 11'	M.9, G.41, G.11
• Super Spindle	2178	5382	2' x 10'	M.9, G.41, G.11

Slender Spindle/M.9



Triple Row Slender Spindle/M.9



Geneva Y-trellis/M.26



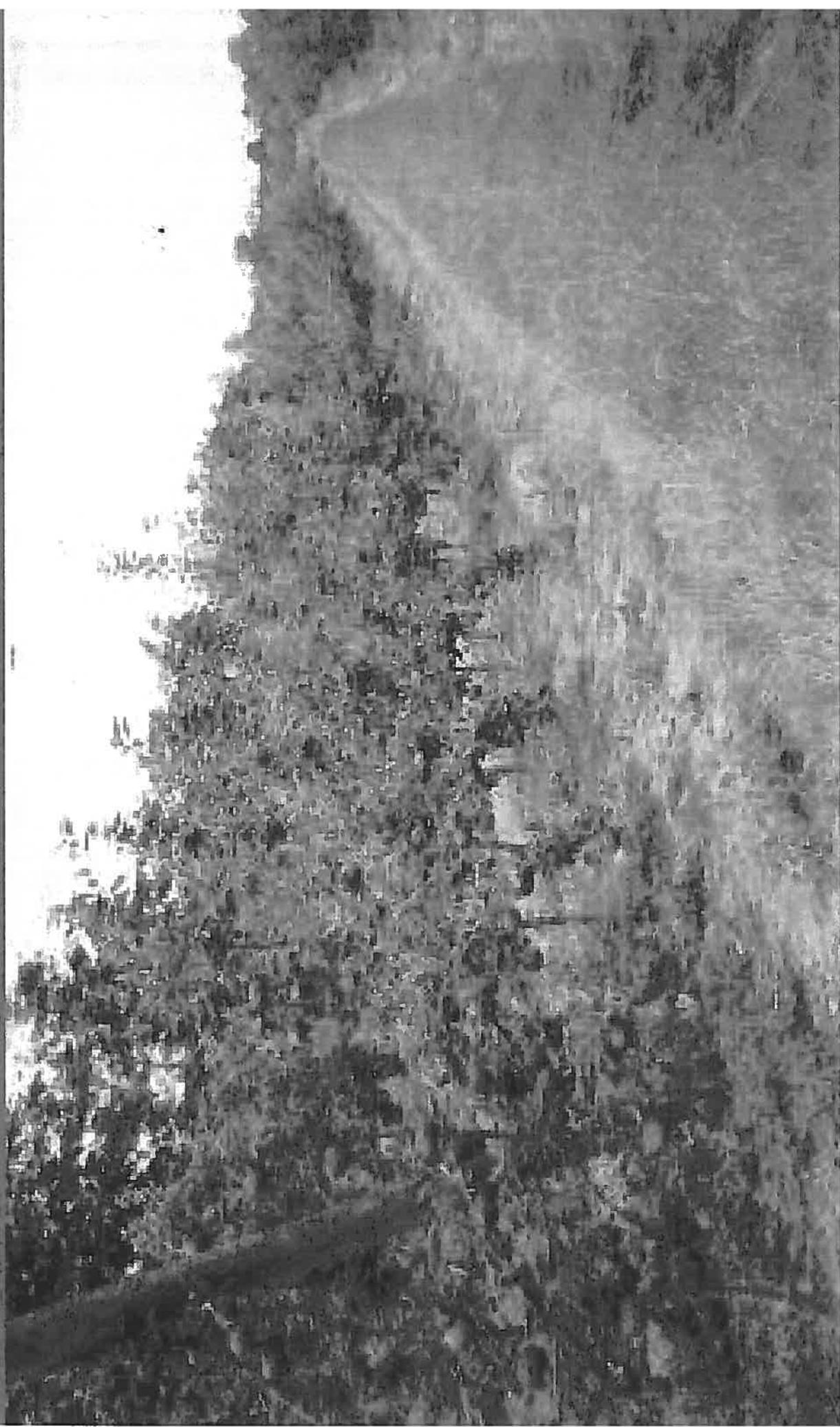
USA-Vertical Axis/G.202



V-Slender Spindle/M.9



Gala Super Spindle/M.9 (Second Leaf)



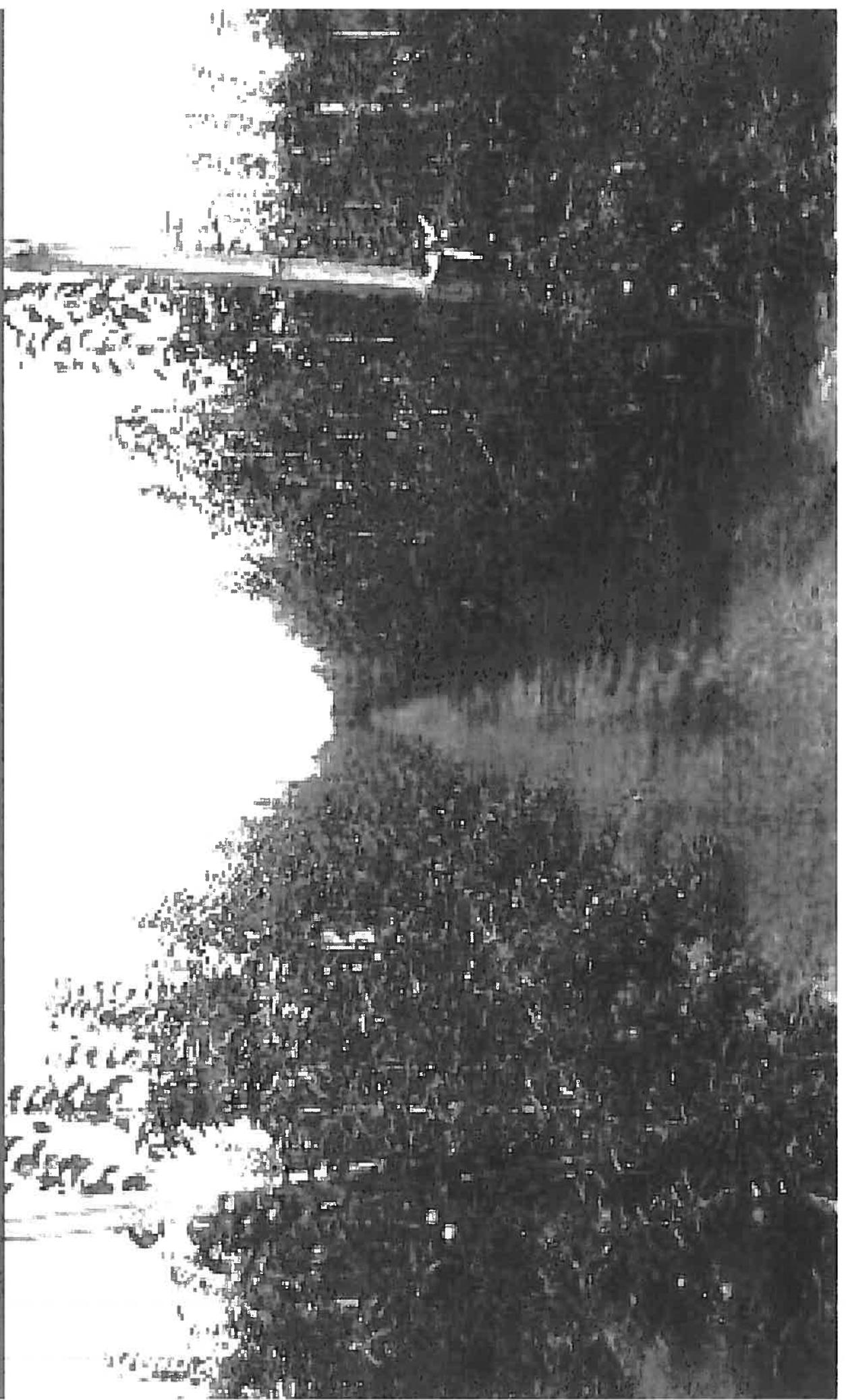
Tall Spindle/M.9
(Note high branches that
do not need to be tied up.



Braeburn Tall Spindle/M.9 (Third Leaf)



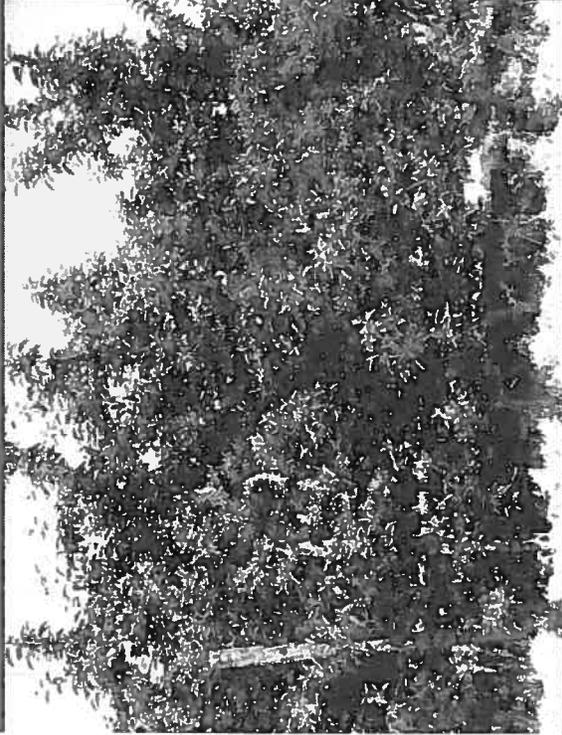
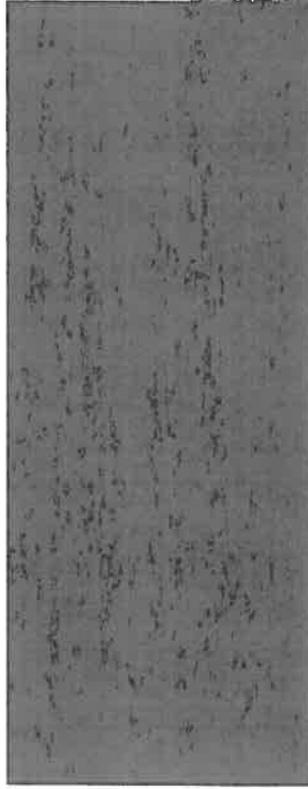
Tall Spindle/M.9



The Geneva Planting Systems Trial

(Planted 1997)

System	Spacing
Slender Pyramid/M.7	10' X 18'
Slender Pyramid/M.26	8' X 16'
Vertical Axis/M.9	7' X 15'
Vertical Axis/M.9	6' X 14'
Slender Axis/M.9	5' X 13'
Slender Axis/M.9	4' X 12'
Tall Spindle/M.9	3' X 11'
Super Spindle	2' X 10'



Super Spindle

0.6 x 3.1m

3m tall



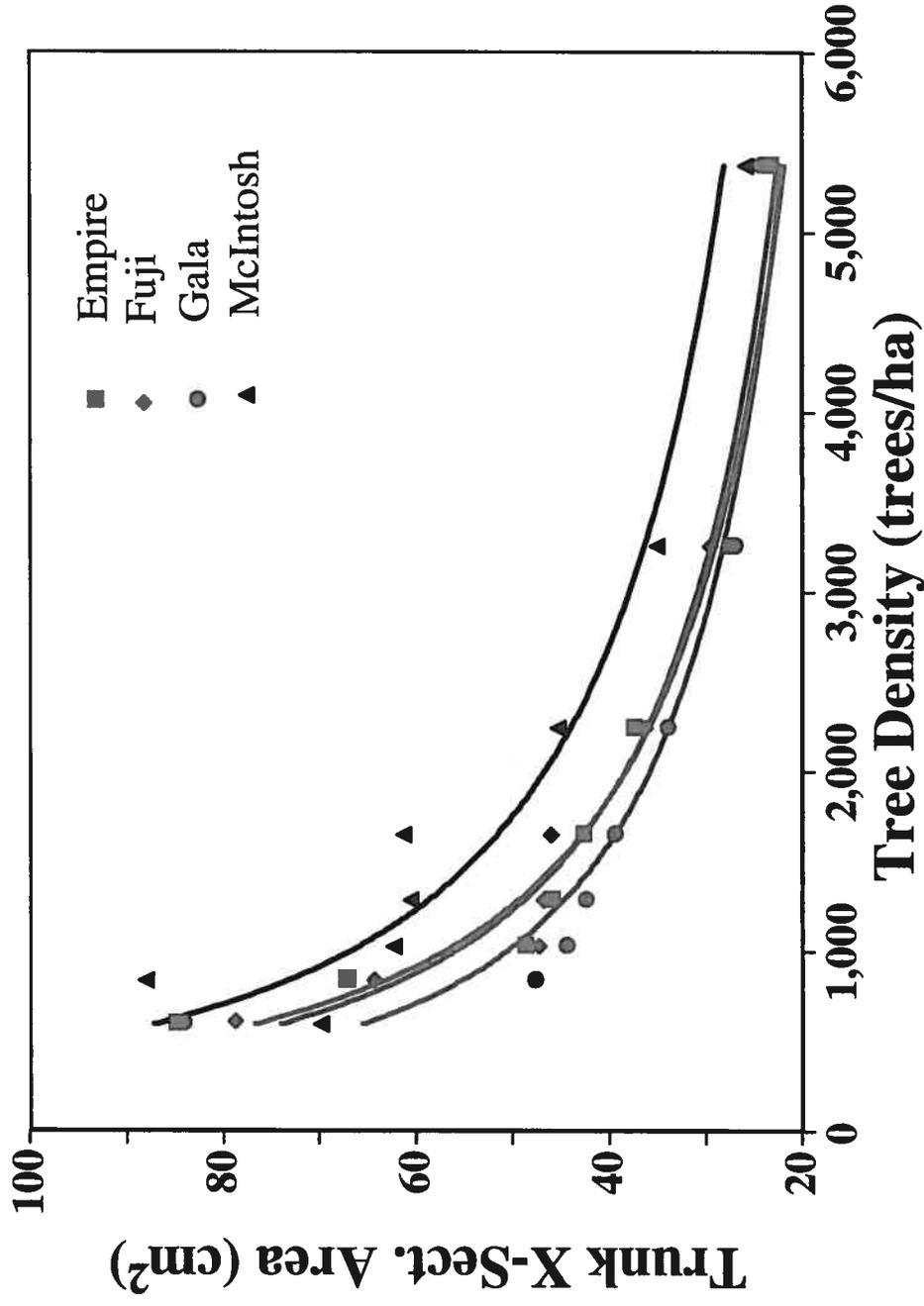
Tall Spindle

0.9 x 3.3m

3.2m tall

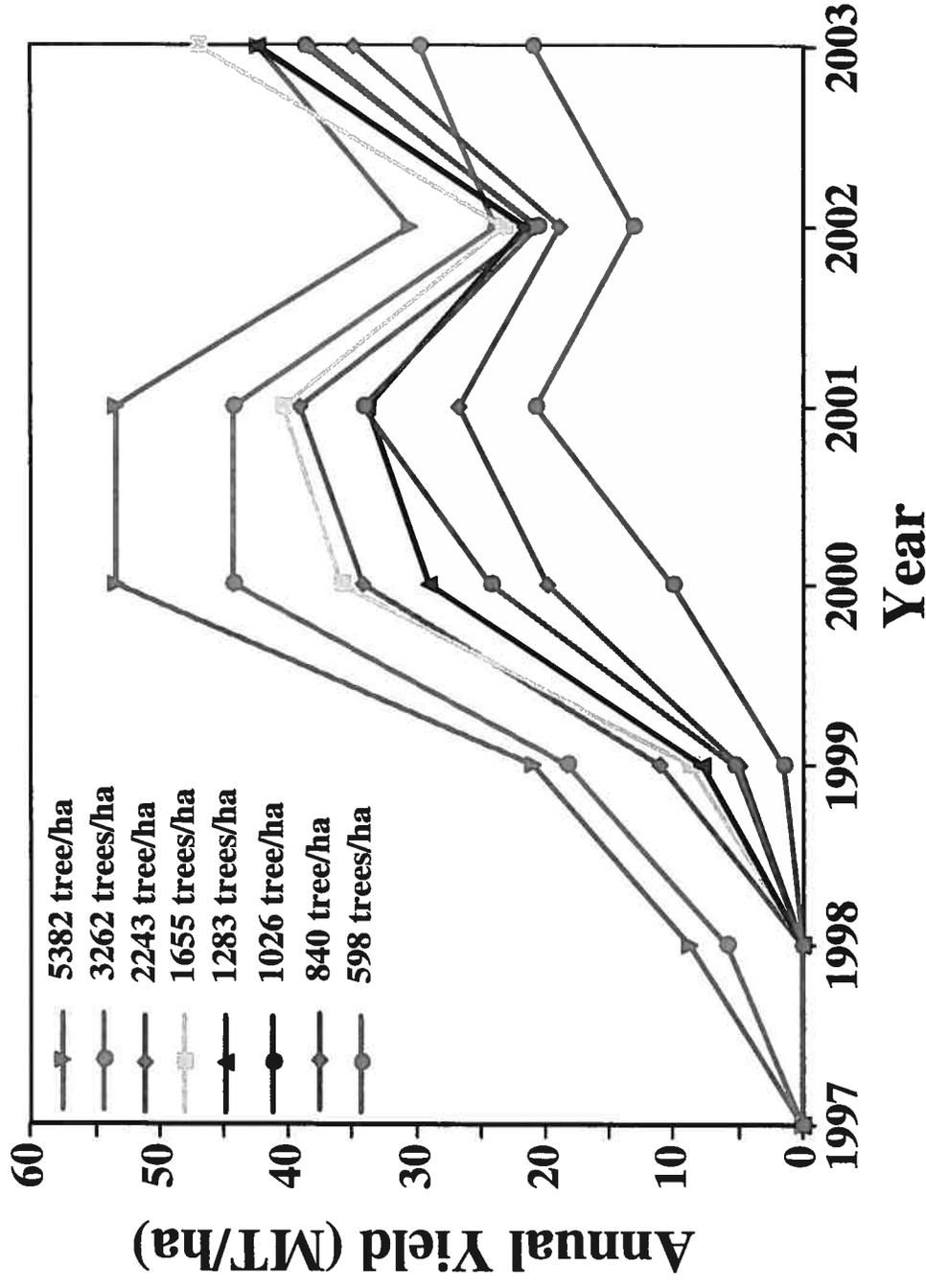


Effect of Tree Density on Tree Size



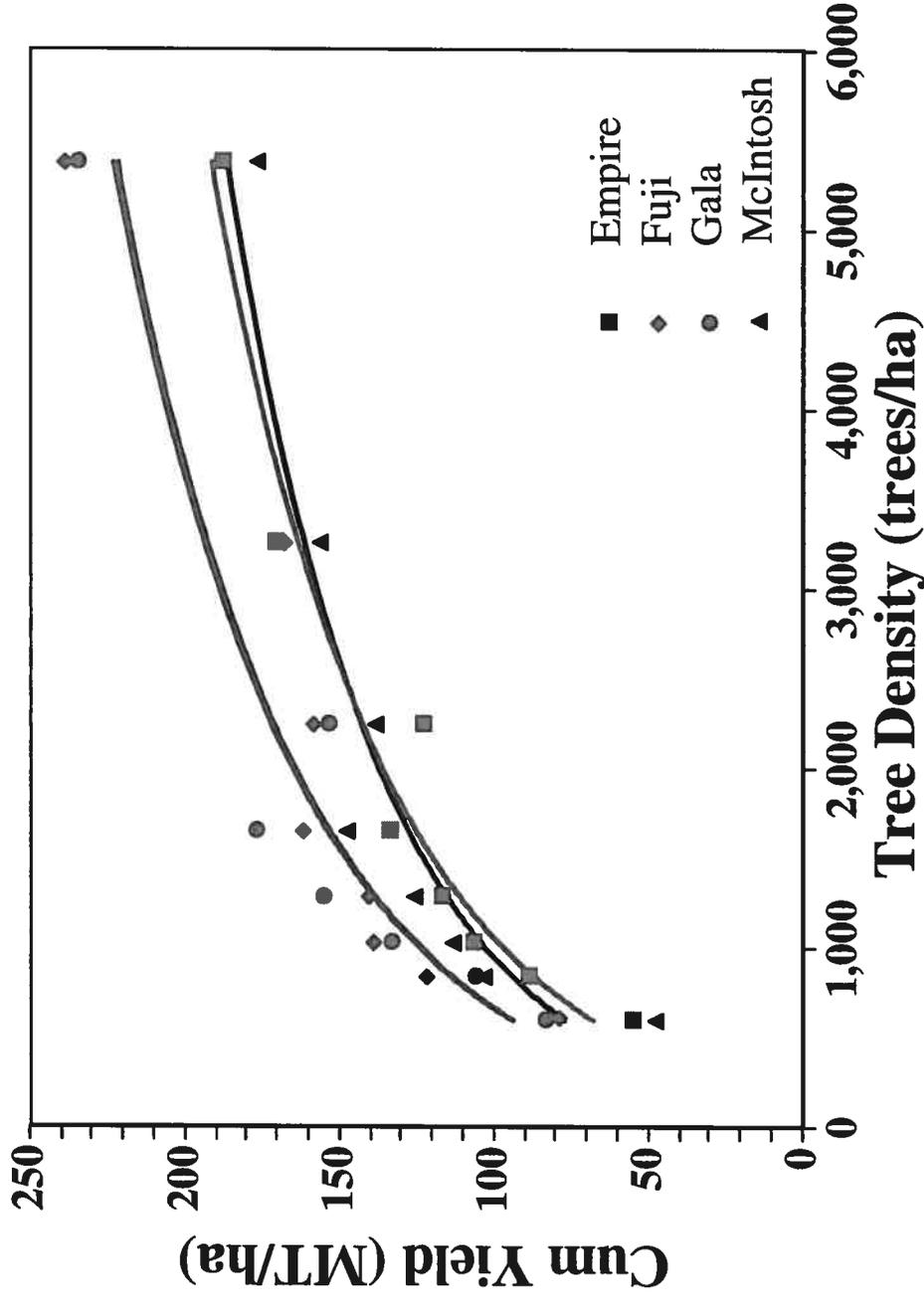
- Tree density and variety had a highly significant effect on final trunk cross-sectional area.
- Among M.9 treatments the highest planting density produced trees about 1/3 the size of the lowest planting density.

Yield Curves for 8 Orchard Systems

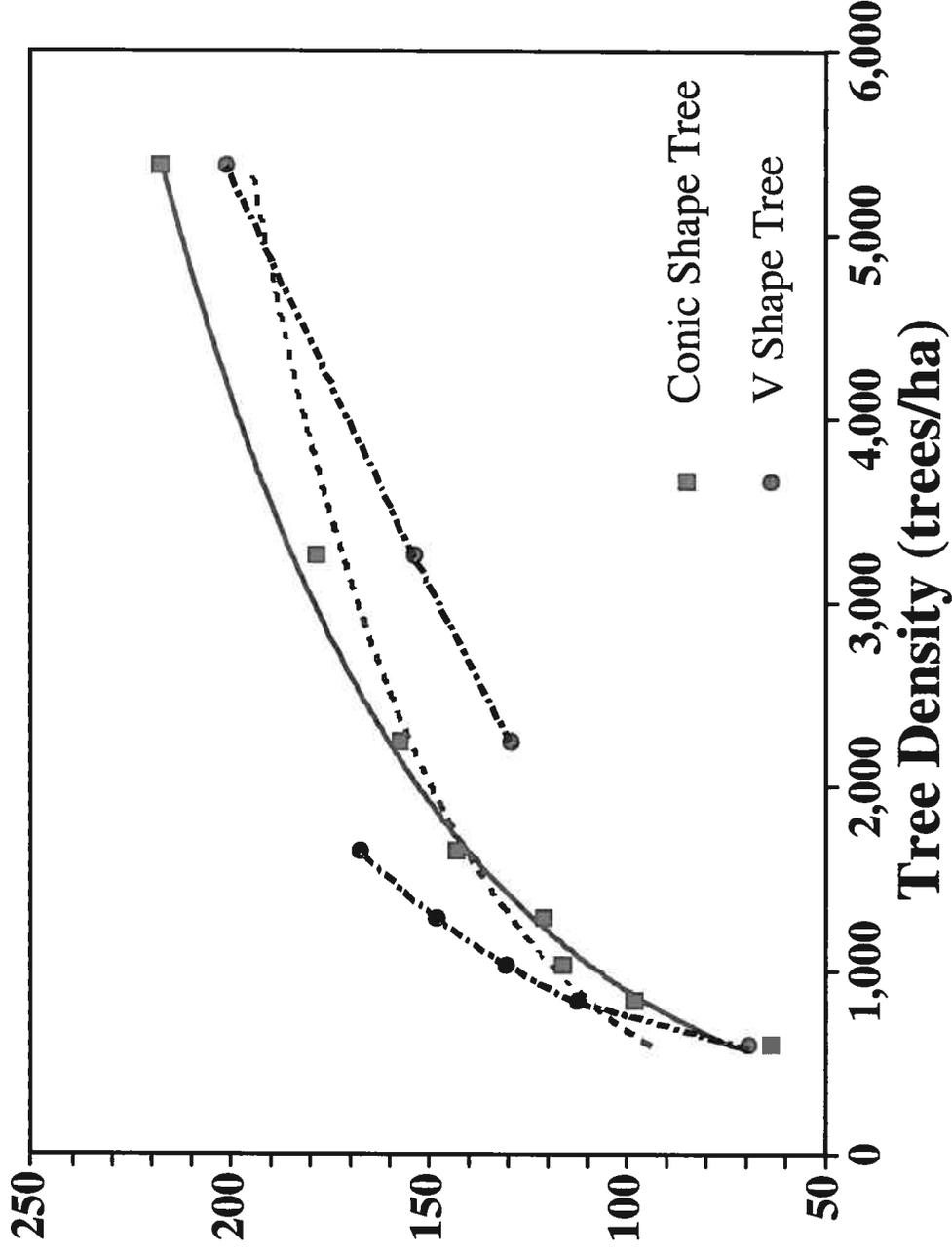


Tree density had a highly significant effect on yield per ha. The highest density system achieved 50Mt/ha on the 4th year while the lowest density system did not surpass 25 Mt/ha.

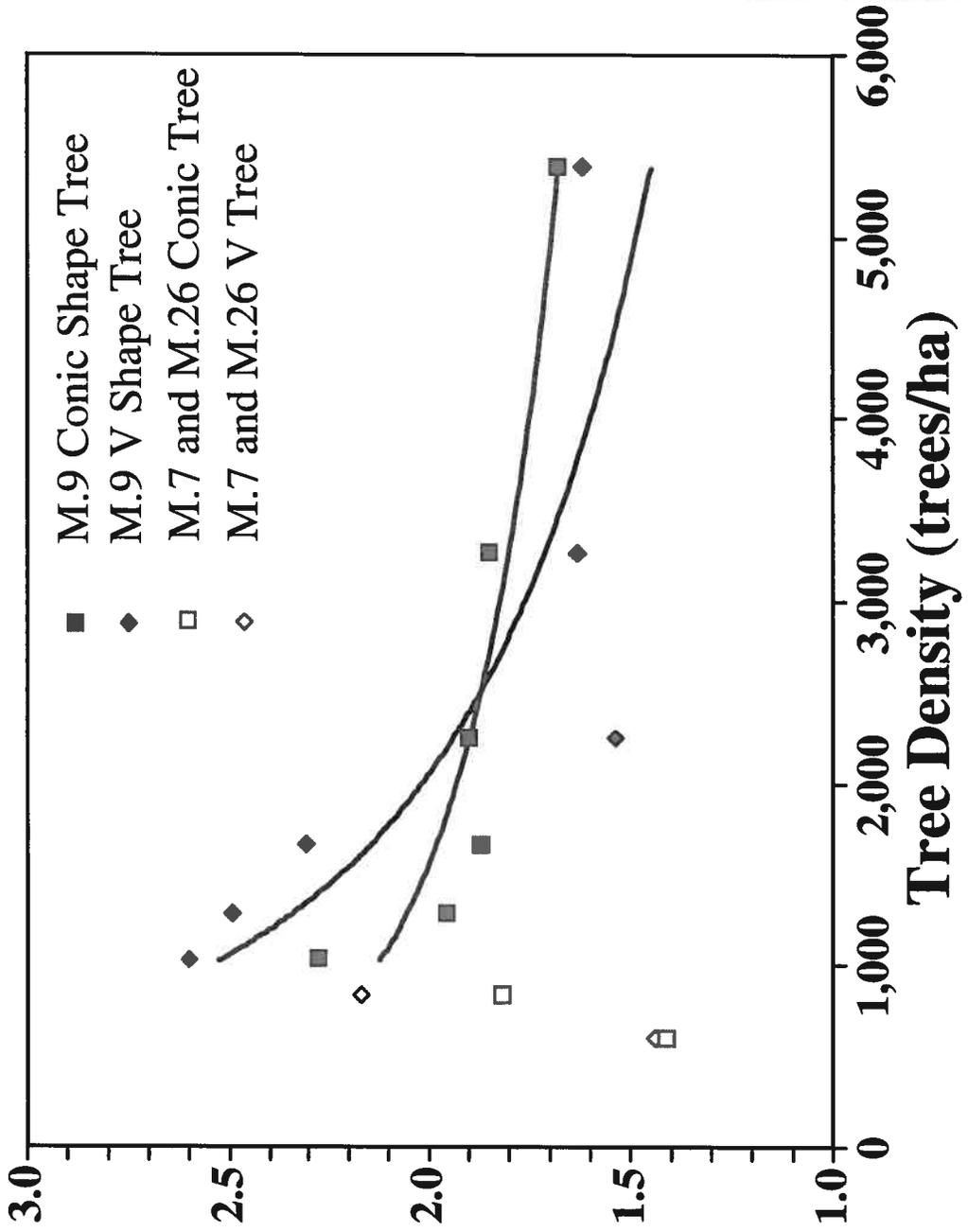
Effect of Tree Density on 7 Yr. Cumulative Yield



Tree density had a highly significant negative effect on cumulative yield per tree but a highly significant positive effect on yield per ha. The cumulative yield per ha of the highest tree density was 3X greater than the lowest density



• There was no significant effect of tree shape on yield but there was a significant interaction with tree density. At high tree densities the V shape was inferior to the conic shape while at lower tree densities the V shape was superior to the conic shape.



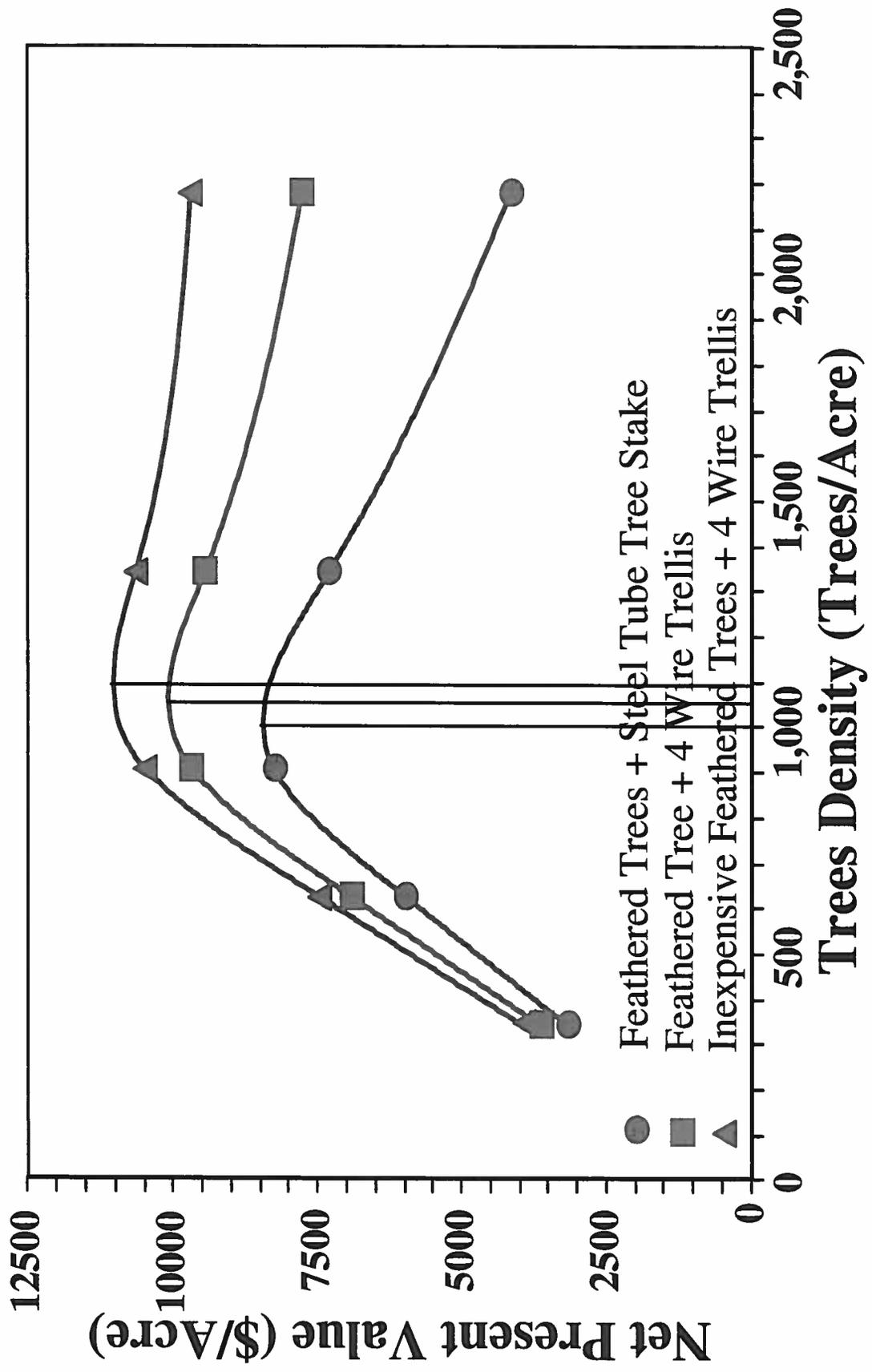
Increasing tree density had a strong negative influence on yield efficiency of M.9. The highest tree density had a similar yield efficiency as M.7.

Conclusions

- Tree density had a strong influence on tree size, yield per hectare and light interception.
- The very high tree densities achieved a high yield of 50 Mt/ha by the fourth year and had a cumulative yield 3X the lowest densities.
- Tree shape had no effect on tree size or yield.

Orchard System Performance in Northern NY- 2005

Variety	System	Tree Den.	Yield/Acre (bu.)			
			2nd	3rd	4th	Cum
•McIntosh	Central Leader	218	0	1	24	25
•	Slender Pyramid	444	0	37	113	150
•	Vertical Axis	726	2	239	327	566
•	Tall Spindle	1307	13	351	771	1135
•Honeycrisp	Central Leader	218	0	1	27	28
•	Slender Pyramid	444	0	33	117	150
•	Vertical Axis	726	0.1	111	277	388
•	Tall Spindle	1307	3	132	578	713



With traditional fruit prices, profitability over 20 years increases with increasing tree density up to a density of 1,000-1,100 trees/acre.

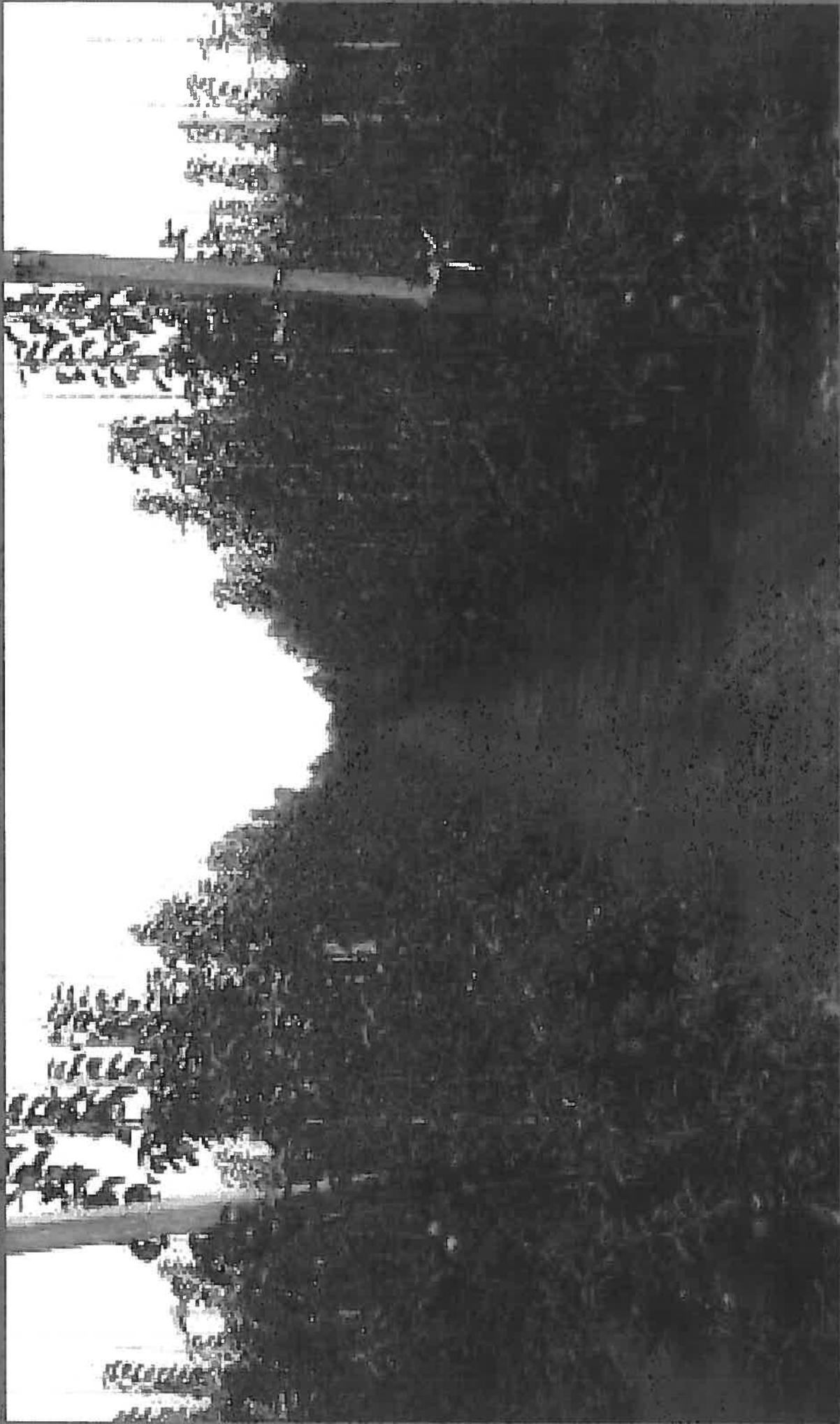
Can you afford to replant and what density should you choose?

- If you receive a farm gate fruit price of at least \$5.50/bu., have land or can buy land for up to \$5,000/acre, can purchase trees for a price of \$5.32, and have access to capital at 5% then you can afford to replant.
- The greatest profitability will be with the Slender Axis system (4' in-row spacing=908 trees/acre) or the Tall Spindle system (3' in-row spacing=1320 trees/acre)
- A 4 wire trellis and feathered trees are essential components of the system.

The Tall Spindle and Slender Axis Systems

- 3-4' in-row spacing
- 10-12' between rows
- 10' tall
- no permanent branches
- highly feathered trees
- minimal pruning at planting
- feathers tied below horizontal at planting.





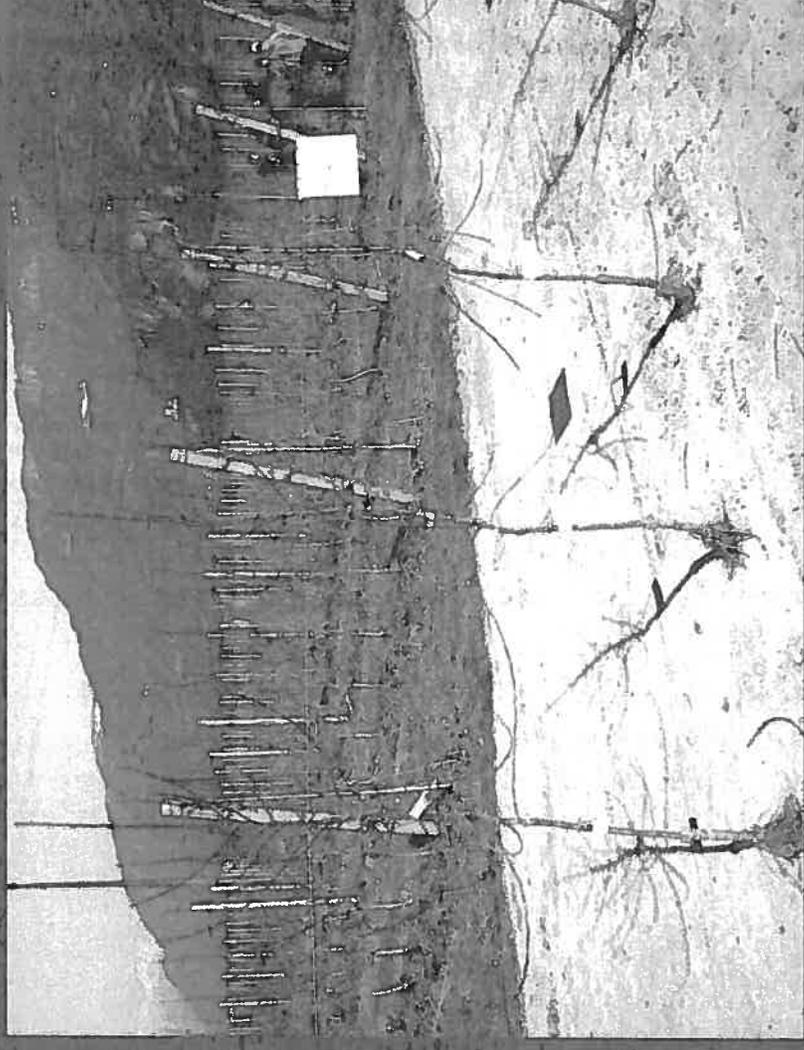
Tall Spindle

Rootstock Selection

- M.9 T337 on vigorous soils or with vigorous scions, Nic29 or Pajam 2 on replant soil or with weak scions)
- B.9 or O.3 are alternatives.
- G.41 or G.11 may be better.

Recommended Tree Type for the Tall Spindle and Slender Axis Systems

- Plant large caliper highly feathered trees (8-15 feathers).
- Feathers should be high enough (<24") to eliminate the need to tie up feathers.



Tree Spacing of the Tall Spindle

- In-row spacing of 3' for weak growing varieties (Honeycrisp, Delicious, Empire, Macoun, Gala).
- In-row spacing of 4' for vigorous varieties and tip bearing varieties. (McIntosh, Fuji, Cortland, Jonagold, Gingergold).
- Between row spacing should be 12-13' on slopes and 10-11' on level ground.

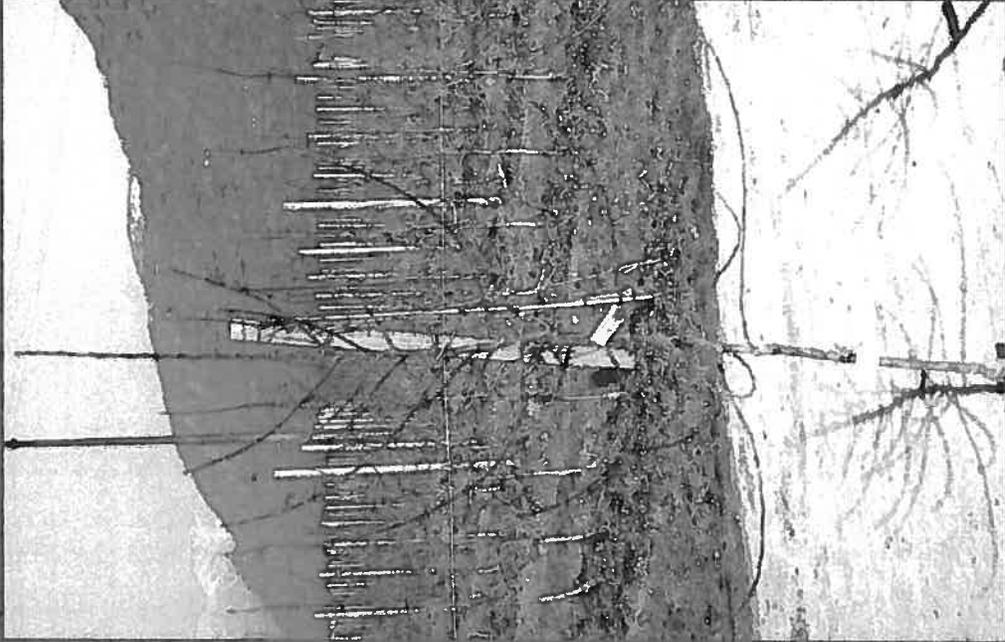
Pruning after Planting of Tall Spindle

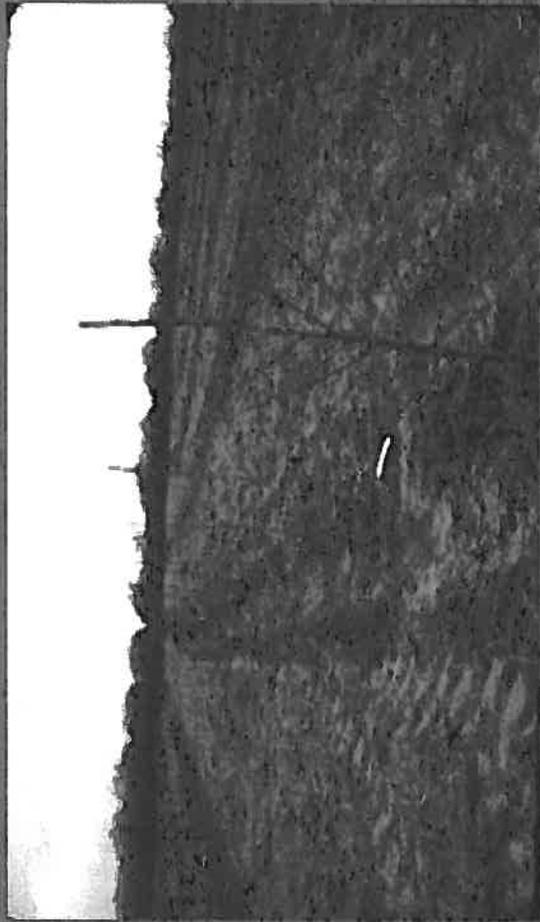
Large caliper highly feathered trees (8-15 feathers).

- Do not head the leader.
- Remove all feathers below 24".
- Remove feathers that are larger than $\frac{2}{3}$ diameter of leader.
- Do not tip the feathers.

Medium Caliper poorly feathered trees or whips.

- Head the leader at 60".
- Remove feathers larger than $\frac{2}{3}$ diameter of leader.
- If there are less than 3 good feathers remove them using a bevel cut.
- Score above every other bud along leader from 24" -42" high.





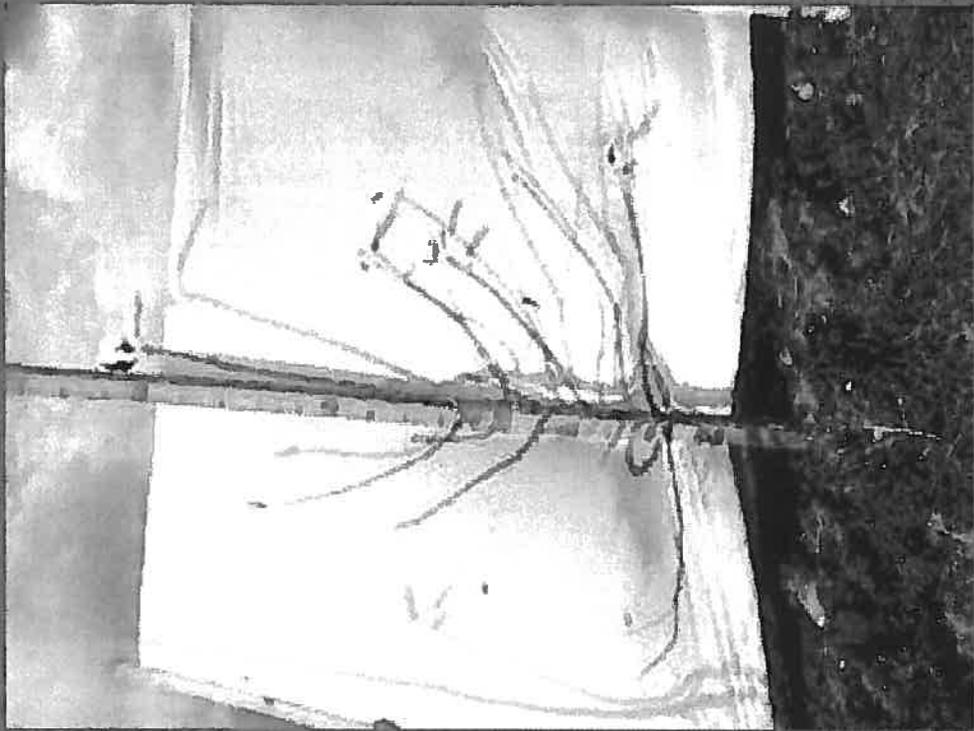
Tree Training During the First Summer

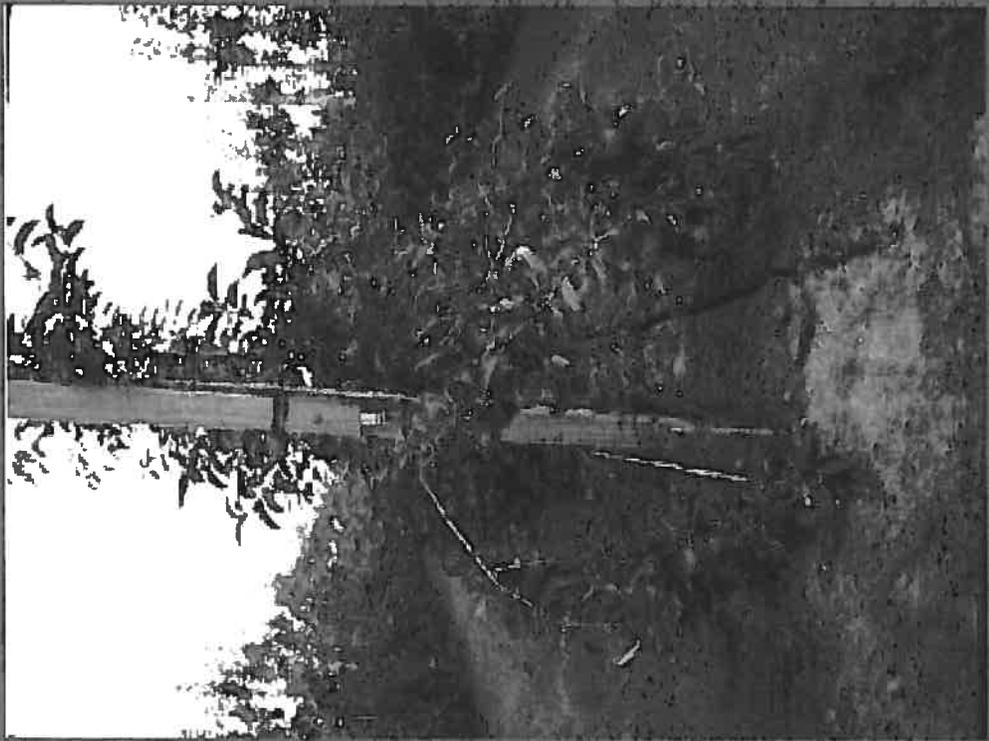
- Pinch side shoots in upper 1/4 of leader when shoots are 4-5" long.
- Re-pinch side shoots in upper 1/4 of leader when regrowth is 4-5" long.
- Tie leader to support system.
- Tie down 4-5 lower branches below horizontal at planting or in July to induce flowering.



Pruning Year 2

- Do not head leader.
- Do not head feathers
- Remove side branches that compete with leader using a bevel cut.
 - Remove narrow angled branches.
 - Remove scaffolds that are larger than $\frac{2}{3}$ diameter of leader.
 - Remove side branches that are longer than 2'.
- Remember "large branches create large trees"



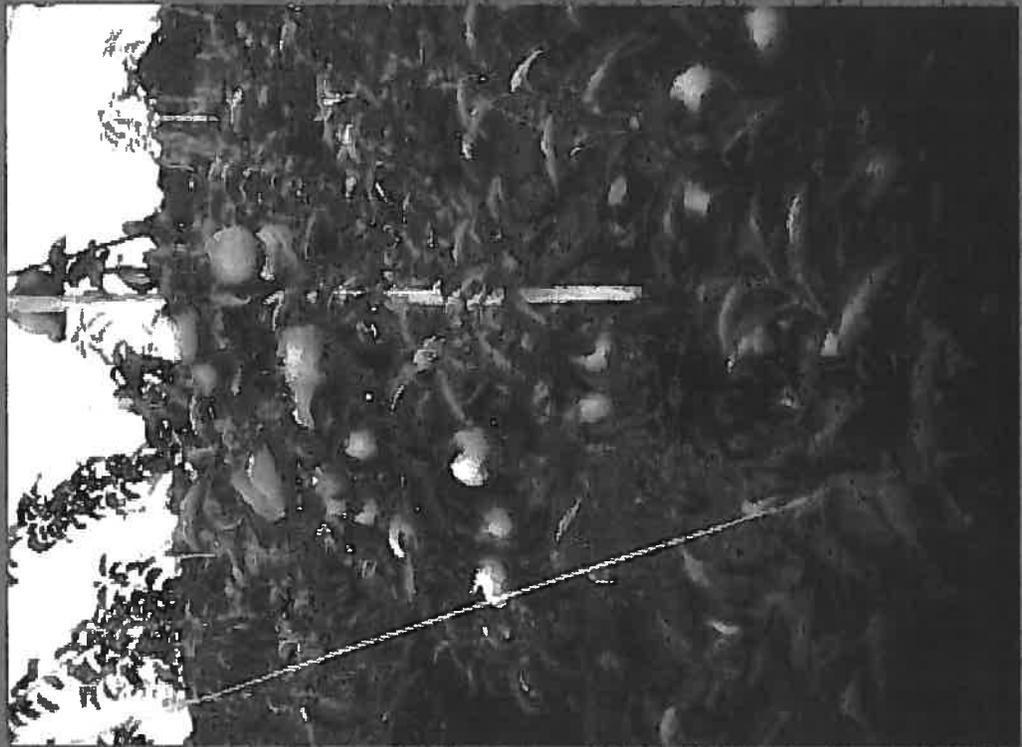


Early Cropping

- "The best way of restricting vegetative growth is to produce apples." (Kurt Werth)
- Cropping must begin:
 - In the second year with the Tall Spindle system.
- Cropping targets for the Tall Spindle
 - Year 1 1-5 fruits
 - Year 2 20 fruits
 - Year 3 40 fruits
 - Year 4 70 fruits
 - Year 5 90 fruits

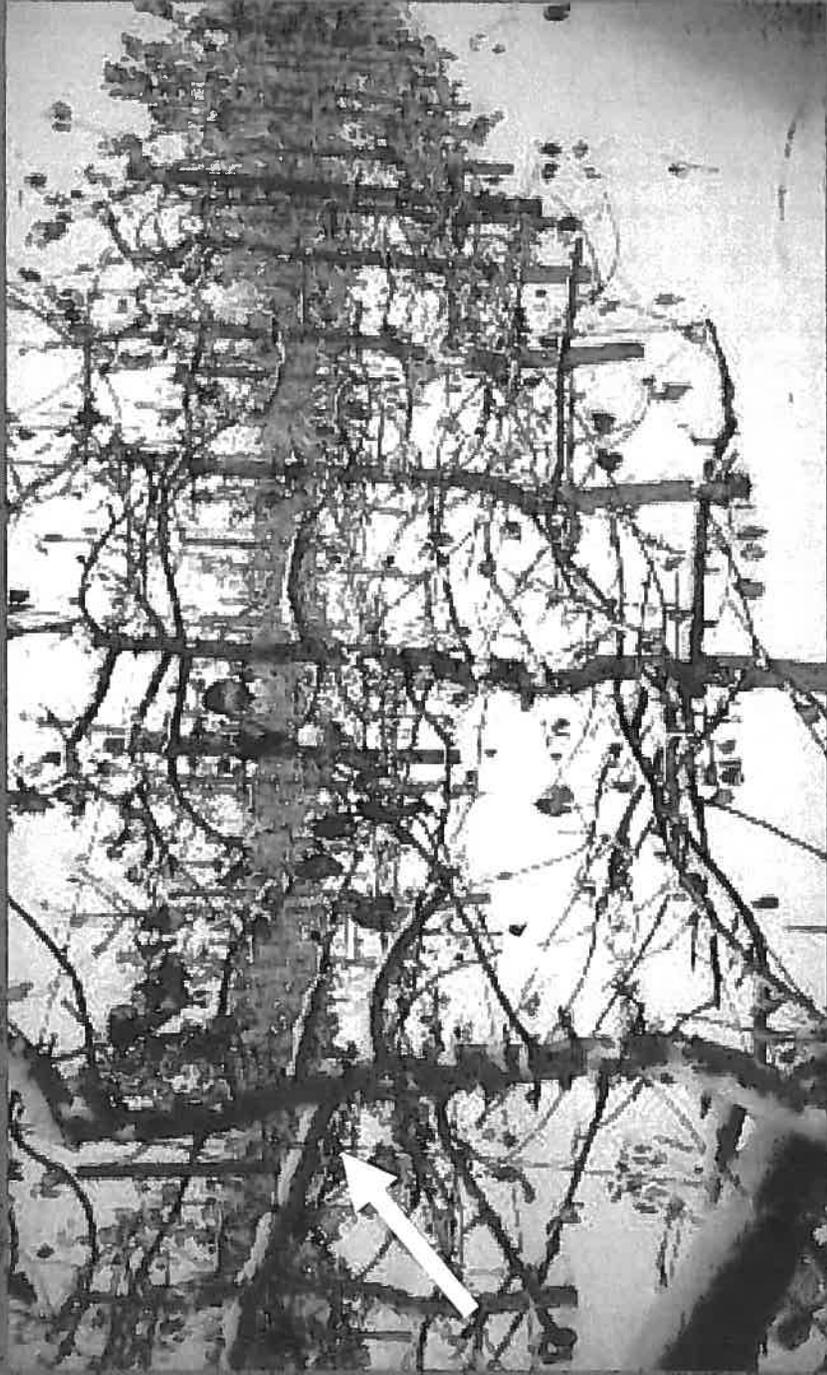
Pruning Year 3-5

- Allow crop to bend the top.
- Limit height of tree only after top has bent by cutting leader to a weak fruitful side branch.
- Remove branches larger than 3/4 inch diameter.
- Remember "large branches create large trees"
- Shorten older, pendant branches to a weak side branch or spur.
- With Gala begin stubbing back pruning.



Pruning Years 6-20

- Limit height of tree by cutting to a fruitful side branch.
- Annually remove 2 branches per year (limb renewal pruning).
 - Focus on the middle tiers of branches first then on upper branches.
- Remove low hanging branches.
- Shorten pendant branches to point of bend.
- Do not overprune.



Young Tall Spindle Orchard



Older Tall Spindle Orchard



Conclusions

- 1) The tall spindle or Slender Axis systems appear to be the most profitable systems.
- 2) High tree density gives high early yield.
- 3) Highly feathered trees are the key to the systems.
- 4) Minimal pruning at planting (No heading the leader or tipping the feathers at planting)
- 5) Branch angle management. Bending feathers below horizontal at planting induces early cropping and limits branch size.
- 6) Branch caliper management. Ruthless removal of large branches keeps trees manageable. "Large branches create large trees"
- 7) "The best way of restricting vegetative growth is to produce apples."

HUMBOLDT COUNTY GENERAL PLAN

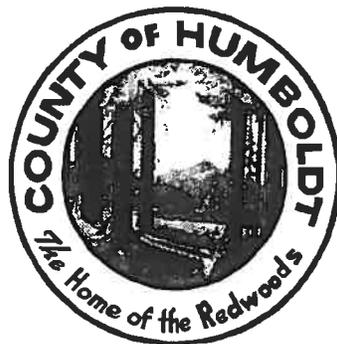
Volume II

EEL RIVER AREA PLAN

of the

Humboldt County

Local Coastal Program



April 2007

- d. The capacity of the extension is limited to a size adequate to meet existing agricultural and domestic requirements.

B. EXTENSION OF THE URBAN LIMIT LINE

1. Where an area not zoned for agricultural or forestry uses is contiguous to an Urban Limit Line; and where 50% of the existing parcels in the subject area have been developed; and where the Urban Service Area is served by a special district or private utility, and both sewer and water service have been extended to the Urban Limit Line adjacent to the subject area; then the County shall set a public hearing before the Planning Commission, based on which the Commission shall recommend to the Board of Supervisors whether the Urban Limit Line be amended to include the subject area. The Commission shall recommend amending the Urban Limit by amendment of the land use plan as provided in Section 30514 of the Coastal Act if the following findings are made:
 - a. Service systems within the Urban Limit are adequate to serve the proposed addition under Urban Development Standards.
 - b. Development allowable in the addition under Urban Development Standards would not adversely impact agricultural or timberlands bordering the addition.
 - c. Expansion of the Urban Limit and the development permitted under such expansion shall be consistent with the Resource Protection Policies and Standards in Section 3.40.

3.34 AGRICULTURE

*** 30241. The maximum amount of prime agricultural land shall be maintained in agricultural production to assure the protection of the areas' agricultural economy and conflicts shall be minimized between agricultural and urban land uses through all of the following:

- (a) By establishing stable boundaries separating urban and rural areas, including, where necessary, clearly defined buffer areas to minimize conflicts between agricultural and urban land uses.
- (b) By limiting conversions of agricultural lands around the periphery of urban areas to the lands where the viability of existing agricultural use is already severely limited by conflicts with urban uses and where the conversion of the lands would complete a logical and viable neighborhood and contribute to the establishment of a stable limit to urban development.
- (c) By developing available lands not suited for agriculture prior to the conversion of agricultural lands.
- (d) By assuring that public service and facility expansions and nonagricultural development do not impair agricultural viability, either through increased assessment costs or degraded air and water quality.
- (e) By assuring that all divisions of prime agricultural lands, except those conversions approved pursuant to subdivision (b) of this section, and all development adjacent to prime agricultural lands shall not diminish the productivity of such prime agricultural lands.

*** 30242. All other lands suitable for agricultural use shall not be converted to nonagricultural uses unless (1) continued or renewed agricultural use is not feasible, or (2) such conversion would preserve prime

agricultural land or concentrate development consistent with Section 30250. Any such permitted conversion shall be compatible with continued agricultural use on surrounding lands.

A. IDENTIFICATION OF AGRICULTURAL LANDS - PRIME/NON PRIME

1. Lands outside Urban Limit Lines that are prime agricultural lands based on the adopted definition of prime lands of the State of California shall be planned for continued agricultural use, and no division or development of such lands shall be approved which would lower the economic viability of continued agricultural operations on them.
2. Lands outside Urban Limit Lines that are not prime agricultural land, but are in agricultural use, have present or future potential for significant agricultural production, and/or are contiguous or intermixed smaller parcels on which non-compatible uses could jeopardize the agricultural use of adjacent agricultural lands shall be planned or continued agriculture.
3. Non-prime agricultural land may be converted to other types of land use only when the long-term economic infeasibility of continued agricultural operation is shown to exist; and no division of or development of such lands shall be permitted which would lower the viability of continued agricultural operations on adjacent agricultural lands.
4. Within areas planned for long-term productive agricultural use, no agricultural land division will be approved where any parcel created thereby is less than 60 acres. However, divisions of these agricultural lands to a minimum size of 20 acres otherwise consistent with this chapter may be approved pursuant to rezoning and parcel map procedures, subject to the below conditions, if the County or Commission on appeal, finds that the division is necessary for a specific agricultural purpose (e.g. to provide for a separate starter farm for a family member), the division will not adversely affect the area's agricultural economy or habitat resources. The rezoning and parcel map may be approved only upon satisfaction of all the following conditions:
 - a. Execution of an Agricultural Preserve Contract (Williamson Act Contract) with the County.
 - b. Acknowledgment either on the parcel map or in a covenant within the chain of title that although the new parcel is of a size below that considered a viable economic agricultural unit, its creation was approved for a specific agricultural purpose, and no further division or other conversion from agricultural use, except to other open space or habitat restoration use, will be allowed in the future even if agricultural use of such separate parcel does not provide adequate economic return.
5. Rezoning conforming to this section of the land use plan shall be reviewed and considered as minor amendments to the certified local coastal program.
6. These policies and requirements regarding new divisions of lands planned Agriculture Exclusive, apply only as long as they are required by this Plan.

B. COMPATIBLE USES

1. The zoning of all agricultural lands shall not permit any use that would impair the economic viability of agricultural operations on such lands; and a conditional use permit shall be required of any proposed use not directly a part of agricultural production of food or fiber on the parcel;

except that on parcels of 60 acres or larger, a second house for parents or children of the owner-operator shall be considered a direct part of agricultural production.

Other uses considered compatible with agricultural operations include:

- a. Management for watershed
 - b. Management for fish and wildlife habitat
 - c. Recreational uses not requiring non-agricultural development under the control of the owner.
 - d. The erection, construction, alteration, or maintenance of gas, electric, water or communications transmission facilities. (Radio or television transmitting antennae shall require a conditional use permit; but such a development shall not in concept be considered incompatible with agricultural use per se.)
 - e. Farm labor housing and temporary labor camps of less than one year duration shall require a conditional use permit.
2. Where land zoned for agricultural use is adjacent to land in residential use, the establishment of hog production involving more than three adult animals (over 6 months old) shall require a conditional use permit.
 3. No greenhouse shall be approved for use on prime agricultural land, where the greenhouse has a slab foundation that would cover the underlying soil.

C. GRAZING LANDS - TABLE BLUFF

1. Grazing lands on Table Bluff shall be designated for agricultural use to insure availability of upland grazing sites and minimize conflicts with agriculture from conversion of these lands to other uses.
Division of these lands may be permitted into parcels of less than 160 acres only when consistent with this Plan's agriculture policies and other policies of Chapter 3 and when approved pursuant to rezoning and parcel map procedures provided:
 - a. The total number of building sites shall not exceed a density of one unit for each 20 acres of the original parcel.
 - b. New lots or parcels shall be no less than one acre and no larger than 2-1/2 acres, and shall be clustered adjacent to existing developed areas of the ranch or on portions of the site least suited for agricultural use and with the least adverse effects on coastal resources.
 - c. The surplus land area resulting from the division shall be committed to agricultural use through two or more of the following devices:
 - (1) Execution of an agricultural preserve contract with the County.
 - (2) Acknowledgment either on the parcel map or in a covenant within the chain of title that the new parcel is of a size considered a viable or economic agricultural

unit, its creation was approved for a specific agricultural purpose, and no further division or other conversion from agricultural use will be allowed in the future even if agricultural use of such separate parcel does not provide adequate economic return.

- (3) Conveyance of an open space easement to the County of Humboldt or other public entity or private non-profit corporation having as its chief goal the preservation of agricultural or open space lands.
 - (4) Conveyance of development rights.
- d. Rezoning conforming to this section of the land use plan shall be reviewed and considered as minor amendments to the certified local coastal program.

D. GRAZING LANDS - CENTERVILLE BEACH TO GUTHRIE CREEK

1. Non-prime grazing lands located between Centerville Beach and Guthrie Creek, within the Eel River Planning Area, shall be designated for agricultural use to insure the continuation of large acreage grazing operations. Division of these lands may be permitted into parcels of less than 600 acres only when consistent with this plan's agriculture policies and other policies of Chapter 3 and when approved pursuant to rezoning and parcel map procedures provided:
 - a. The total number of building sites shall not exceed a density of 1 unit for each 160 acres of the original parcel.
 - b. New lots or parcels shall be no less than 1 acre and no larger than 5 acres, and shall be clustered adjacent to existing developed areas of the ranch or on portions of the site least suited for agricultural use and with least adverse effects on coastal resources, consistent with the policies of this plan.
 - c. The surplus land area resulting from the division shall be committed to agricultural use through two or more of the following devices:
 - (1) Execution of an agricultural preserve contract with the County.
 - (2) Acknowledgment either on the parcel map or in a covenant within the chain of title that the new parcel is of a size considered a viable or economic agricultural unit, its creation was approved for a specific agricultural purpose, and no further division or other conversion from agricultural use will be allowed in the future even if agricultural use of such separate parcel does not provide adequate economic return.
 - (3) Conveyance of an open space easement to the County of Humboldt or other public entity or private non-profit corporation having as its chief goal the preservation of agricultural or open space lands.
 - (4) Conveyance of development rights.
 - d. Rezoning conforming to this section of the land use plan shall be reviewed and considered as minor amendments to the certified local coastal program.