

**Western Washington Fruit Research Foundation (WWFRF)
WWFRF Fruit Garden Management Plan
Version 4.0**

Version History	Date
Version 1.05 Revised and unanimously ratified at Fruit Garden Committee meeting Jan. 10. Present at the meeting: Kristan Johnson, Sam Benowitz, Bill Davis, Tom Wake, De Arbogast, not attending due to injury: Jay Scott	Jan. 10, 2013
Version 1.1 SW incorporating Tom Thornton's comments	Feb 21, 2013
Version 1.2 SW adding content at direction of BOD	Feb 24, 2013
Version 3.0 Revised content at direction of Carol Miles. Approved for WSU and submission to WSDA.	May 28, 2013
Version 4.0 Changed seven acre to six acre in Purpose paragraph. Revised pest management plan to reflect some current practices. 2017 changes listed in Change page at end of plan	Feb 26, 2017

Document Approvers

Name	Title	Date Approved
Chad Kruger	WSU – NWREC Mt Vernon Director	Submitted to WSU NWREC 3/1/2017 Approval pending
Dan Gorton	WSU – NWREC Facility Operations	
Kim Siebert	WWFRF President	2/26/2017
Tom Wake	WWFRF Fruit Garden manager	2/26/2017
Kristan Johnson	WWFRF Fruit Garden Committee Chair	2/26/2017

Plan Purpose

This Garden management plan details how WWFRF volunteers will maintain the fruit trees and plants growing in the six acre Fruit Garden under the guidance of the WSU-NWREC horticulture program. We will move towards sustainable practices based upon Integrated Pest Management methods, while employing the least toxic methods which have demonstrated the capability to provide the required pest control..

Change Management of this document

This is a living document which will be reviewed and updated as new information becomes available. The guideline for accepting changes will be that changes will be

first reviewed first by the Garden Committee and an assessment of the impact provided. If the change is controversial or there is uncertainty of the impact of the change, the requested change shall be sent to a third party for review. Final acceptance of the change will be with Chad Kruger or his designated WSU-NWREC representative.

Introduction

The WWFRF exists to advance fruit horticultural programs for our unique Western Washington maritime climate through advocacy, research, education, and demonstration for the benefit of the general public, related commercial interests, and the home gardener/orchardist.

WWFRF goals include but are not limited to:

- Support fruit research in the Pacific Northwest maritime region.
- Maintain the WWFRF Fruit Garden to demonstrate fruit growing methods and fruit varieties and provide education to home gardeners/orchardists.
- Hold events with a focus on education and demonstrations to advocate good fruit growing practices and showcase the Fruit Garden.

The WWFRF Fruit Garden is located at the WSU Mount Vernon Northwest Washington Research and Extension Center (NWREC). The Fruit Garden is open to the public seven days a week from dawn to dusk. WWFRF is responsible for all costs associated with the maintenance of the garden.

The Fruit Garden is maintained by WWFRF volunteers. Garden managers direct, supervise, and train volunteers as well as guide overall garden health, field trials and future planning. Work parties currently are conducted every Thursday throughout the year (except December). Garden fruit is available to active volunteers. General WWFRF members are allowed to harvest fruit at two annual harvest events. Harvest Events are open to non-members for one-day-only fees.

The Fruit Garden Committee will determine when and which plant varieties are added or removed from the garden. The Fruit Garden Committee will submit the list of changes to a qualified fruit garden designer (professional background in park design). The fruit garden designer will subsequently respond to the Fruit Garden Committee by confirming the proposed changes or presenting alternative designs integrating the requested changes while maintaining the integrity of the originally approved overall Fruit Garden design. Fundamental principles for successful large scale park design include consideration of circulation (path layout and related functions i.e. tractor access), maintaining view corridors and open space for events (oval), space for future growth, variety disease and insect pest resistance, and tree maintenance compatibility, especially in regards to pesticide applications. An agreed upon design modification will then be presented to the WWFRF Board for ratification. WSU faculty liason will be advised.

The guiding principles for deciding what to add or remove are:

- Replacement of trees lost due to disease, with a preference given to heritage varieties to replace heritage apple trees
- Provide a home to fruit plant varieties from research trials that might be destroyed if not moved into garden
- Interest in new varieties of edible fruit plants appropriate to the Northwest climate, i.e: tree size (root stock), cultural methods (training), cultural (historical value), pest and disease resistance, pollination potential, flavor, culinary, nutritional value, fruit storage capability, plant growing habit, unique beauty of plant (e.g.red leaved plum).
- Types of plants under or over represented in the Fruit Garden
- When appropriate, the Fruit Garden will focus on representing the selections listed in the *Fruit Handbook for Western Washington WSU* (EB0937) and *New Alternative Fruit Crops for Western Washington WSU* (EB2002)
- Garden design and space available for new material
- Effort it takes to maintain the Fruit Garden, i.e. volunteer time to maintain existing trees as well as new plants/trees

Since the focus is on home gardening/orcharding and gardener safety, tree height will be kept to 10-12 feet where possible, and disease and pest control methods, whether mechanical or chemical, will be appropriate for home gardens/orchards. The exceptions will be the antique apple trees and nut trees.

The WFFRF Garden Committee reserves the right to make specific changes as warranted, i.e. due to insect pest infestation.

Management of fruit diseases and insect pests

Disease and insect pest management in the Fruit Garden is based on an Integrated Pest Management (IPM) approach, using monitoring whenever possible, and preventative spray applications only where essential. IPM is an ecosystem-based strategy that focuses on long-term prevention of pest damage through a combination of techniques which include biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied *in a manner that is consistent with the product label*, and minimizes risks to human health, beneficial and non-target organisms, and the environment.

The WSU hortsense website

<http://hortsense.cahnrs.wsu.edu/Home/HortsenseHome.aspx>

is a key source for pest management information for home gardeners and will be used by volunteers as the primary guide for managing pest problems in the Fruit Garden. Cultural controls and Integrated Pest Management (IPM) methods will be the first choice

whenever possible. Only EPA and Washington-registered pesticides can be used in the Fruit Garden.

The current version of the WSU publication, EB0419 Crop Protection Guide for Tree Fruits in Washington (updated annually) is a comprehensive source of pest and disease management information, and will be used as appropriate as a secondary source to supplement the information available on the WSU hortsense website.

Monitoring

Pheromone insect pest-monitoring traps will be placed by WWFRF volunteers at appropriate times during the season to monitor for apple maggot and codling moth. Weekly tree inspections for insect pests and diseases will be performed by knowledgeable volunteers.

Pesticide applications

Disease and pest infestations vary in incidence and severity each season, therefore control measures will be adjusted each year based on observed need. The Fruit Garden Spray Committee will create and maintain an annual spray plan and product preference (based on the tables below), submit the plan to the full Fruit Garden Committee for approval, and then provide the plan to the WSU-NWREC facility Operations Manager, who will make arrangements for a certified applicator to apply pesticides at the appropriate time.

A member of the WWFRF Fruit Garden Spray Committee will monitor the Ag Weather Net at NWREC to chart infection periods to maximize efforts and give better control.

Pesticides will be sprayed on days when the weather is conducive; however, if there is an event on that day where the public or any work parties are present, or the re-entry interval would interfere with such scheduled events/work parties, then no pesticides will be sprayed.

A WWFRF volunteer who has a valid, current Washington State pesticide applicator's license can spray home garden products in the Fruit Garden provided the following:

- A copy of the volunteer's applicator's license is on file at NWREC.
- WWFRF must keep a copy of the label for each product that is applied in the Fruit Garden in the notebook that is kept in the shed in the Fruit Garden; additionally, a copy of the label must be given to the WSU NWREC faculty liaison so that it can be added to the NWREC pesticide records.
- Prior to any pesticide application, a notice of 'intent to apply' is sent to the 'all NWREC' email list per NWREC pesticide application protocol.
- A notice of pesticide application must be posted on the pesticide notification board in the Fruit Garden and in the NWREC main building; the Fruit Garden, or areas within, will be posted closed if needed..

- WWFRF must keep a record of all application dates, rates, and areas in the notebook in the Fruit Garden shed.
- The applicator must apply the product accordingly to its label directions.
- Any concentrated products that must be mixed, this includes Roundup, must be mixed at the WSU pesticide area. NO MIXING WILL OCCUR IN THE FRUIT GARDEN.
- Any volunteer who does not follow these guidelines will be dismissed from the Fruit Garden.

Required Communications of Spray Applications

- To Garden volunteers: Sign board on the outside of the shed at the back of the Fruit Garden; past spray records will be kept in the Fruit Garden notebook inside the shed. Area will be posted ‘do not enter’ as appropriate.
- To general public: All entrances to Fruit Garden will be roped off with spray warning signs.

Volunteer Training

All WWFRF Fruit Garden volunteers will be required to complete Worker Protection Standard (WPS) training before they participate in garden maintenance activities. WWFRF garden managers will be trained by WSU-NWREC Horticulture staff to provide training to new garden volunteers. A record of all trained volunteers will be maintained by WWFRF garden managers and a permanent record will be kept by WSU NWREC.

Pest Management Plan for WWFRF Fruit Garden

This management plan is intended to provide a framework for making pest management decisions in the Fruit Garden that is maintained by WWFRF. This plan provides identification and timing of pest management tools. The chemical materials listed have been historically used in the region. WWFRF will consult annually with the WSU faculty liaison as to current label changes. All materials listed in this document must be applied consistent with the product’s current label. All pesticide materials used in the Fruit Garden must have EPA and Washington state registrations.

The Fruit Garden is a public demonstration of how to grow fruit in the region. Utilizing pest management procedures that the public can emulate is one of our goals. We will be transparent with our approach and remember that one of our goals is to inspire people to grow more of their own food.

All Fruit Trees	
Orchard Hygiene	--Prune trees as necessary to control height, provide adequate sunlight to ripen fruit, and provide adequate air flow / ventilation to promote disease control.
	--Rake, pick up, and destroy all fallen fruit and leaves.
	--Prune out and destroy all dead or infected wood.
	--Thin fruit as necessary to manage fruit load on branches.

Dormant spray	--Apply Rex Lime Sulphur plus horticultural oil for dormant season insect and fungus control (organic spray)
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Apples and pears	
Anthracnose	--Continually inspect trees, torch cankers, cut out infected limbs, and remove severely infected trees throughout the season. The best time to inspect for cankers is in late May or early June when it is raining – you will be able to see darkened areas in the bark that are not visible when bark is dry.
	--Mud compress – apply water plus dirt to infected areas.
	--Apply Ziram fungicide – apply spray after fruit harvest and prior to fall rains.
Scab	--Apply micronized sulfur + oil spray at delayed dormant stage. If using only sulfur begin at stage 3-4. If using 1 conventional fungicide per season begin at stage 4-5. Sulfur is only effective when applied before a scab infection occurs. Sulfur inhibits spore germination, it doesn't prevent viable infections from producing lesions in the fruit skin. Monitor leaf wetness duration via Ag Weather Net to minimize the number of fungicide applications.
	--Apply Ziram fungicide – apply spray per product label at pre-bloom stage to pears and apples
	--Apply Rally 40WSP (myclobutanol) to APPLES ONLY (Rally is not labelled for use on pears). Apply when leaves are separating, just exposing bud cluster. Repeat at 14-day intervals for 3 or more applications until weather dries on highly susceptible apple varieties.
Powdery Mildew	--Critical time for controlling mildew is at a late delayed dormant stage. Apple scab and mildew can be managed together without separate sprays for individual diseases. (see apple scab above)
	--Cultural control -- Remove infected leaves and prune severely infected shoots to prevent spread of disease.
Codling moth	--Deploy Isomate CM Flex pheromone mating disruptors.
	--Deploy Scentry Biologicals “sticky” traps with 10x Codling Moth lure to monitor for codling moth presence.
	--Apply Assail 30SG (acetamiprid), AsanaXL (esfenvalerate), or spinosad based on codling moth presence in “sticky” traps.
	--Use Ag Weathernet heat unit data to identify 1 st cover spray. Open IPM DAS in left hand column, click on Codling Moth. Monitor with pheromone traps. Spinosad (Entrust) or CYD-X HP an upgrade of the granulosis virus. OMRI listed with 4 hour REI. Very effective. Most years apply 1 application late June - early July, 1 application if summer

	is mild, 2 if total seasonal heat units are going over 1900 DD's.
	--Cultural control --Apply footies to fruit
	-- Surround (Kaolin Clay). Use for trials only. 1 st Application at petal fall. Make applications every 7-10 days if it has rained.
Oblique banded leaf roller	--Apply Thuricide, Javelin BT. 2-3 applications. 1 st application: stage 3-4 (with first fungicide spray).. 2 nd application: pre-bloom. If fresh damage is apparent when fruit is at 10mm do a 3 rd application. Use pheromone traps for good timing data.

Crop	Disease or Insect	Action¹	Methods
Peach	Peach Leaf Curl	Management/ Application: Cultural	Add curl-resistant varieties (Frost, Townsend & Betty) to the Fruit Garden.
	Bacterial Canker	Micronized Sulfur or Copper Sulfate Copper sulfate	3 applications beginning with bud swell. 2 nd and 3 rd applications approximately 3 weeks apart. 2 applications, 1 st at leaf fall, 2 nd 3-4 weeks later but before first cold snap.
	Leaf rollers	BT/Thuricide	Monitor blossoms at bloom through petal fall for damage. BT applications have best results if sprayed late in afternoons and on cloud cover days.
Plum	Aphids	Management/ Application: Cultural Neem Oil	Scout trees, cut out hot spots. Spray at first sign of aphid infestation. Use heaviest rate that label allows for delayed dormant application.

Crop	Disease or Insect	Action ¹	Methods
Cherry	Cherry Bark Tortrix	Management/ Application: Cultural Spinosad	Scrub trees with a stiff-bristled brush or broom to remove frass where insects may be pupating. In late September spot-spray frass tunnels on trunk until well saturated. Only spray trunk and limbs where frass is evident, do not spray upper canopy. Check spray effectiveness by sweeping off frass in a marked area and see if it reappears over the next 1-2 weeks. Spinosad is not systemic and breaks down relatively quickly, follow the label regarding number of allowable sprays.
	Spotted Wing Drosophila	Spinosad Pyganic Neem/Azadirachtin	Monitor with current SWD recommended traps. Alternate with Pyganic or Neem/Azadirachtin. Make first application at straw color thru harvest. Spinosad 7 days between applications. Pyganic 3-5 days between applications.
All Stone Fruits	Brown rot	Management/ Application: Cultural	Prune peaches and plums at petal fall. Can achieve 100% reduction in blossom infection for two years by delaying pruning.
	Bacterial Canker/ Pseudomonas	Micronized copper and/or Serenade Cultural	1 application at bud break and 1 at post bloom. Apply every 7 days through ripening. Check label for harvest restrictions. Cut out or torch cankers. Remove highly infected trees. See notes in Peach section.
	Fungus	Cultural Micronized Copper	Prune trees in morning of dry days. Apply at leaf fall, 30 days later, and at bud swell in spring.
		Rally 40WSP (myclobutanil) Captan 50	Apply at blossom & before harvest

Crop	Disease or Insect	Action¹	Methods
Blue- berry	Birds	Management/ Application: Cultural	Net blueberry bushes. Experiment using balloons, aluminum tape, and various scare crow type devices. Produce sounds of predators and distressed birds.
	Mummy berry	Cultural	Apply heavy mulch in spring, pick off infected berries.
	Scorch		No low toxicity control program identified for this.

Crop	Disease or Insect	Action ¹	Methods
All trees and shrubs	Voles & Rabbits	Management/ Application: Cultural	Mow surrounding grass, weeds, and watersprouts to keep low.. Install raptor attractors and owl boxes. Paint trunks with sanded paint.
	Weed management	Glyphosate	Spray color-tinted product around each selected tree and bush.
	General orchard health and sanitation	Casoron Weed & Grass Killer	Trial use only. Apply per label for pre-emergent weed control
	Aphids and mites	Cultural	Prune, thin fruit, pick up and dispose fallen fruit Take data on pest and disease resistant fruit varieties. Develop unique organic control for pest and disease.
	Tent caterpillar	Bio control & cultural	Nematode & fungus. Horticultural oil. Insecticidal soap. Allyssium (flower)
	Birds	Cultural	Destroy by torching or remove by hand and destroy by dropping on ground .
	Leaf miner	Cultural	Electrical – sound of predators and distressed birds. Remove by hand

Summary of Version 4.0 Changes (Feb 2017)

- Updated approvers list
- Added definition of Integrated Pest Management
- Added creation of an annual spray plan
- Removed copper Bordeaux treatment – not EPA or state registered
- Amended Surround – kaolin clay treatment for codling moths – not effective plus too many negative side effects for a public display garden. Retained to allow for potential future trials.
- Added Ziram fungicide treatment for anthracnose and scab
- Added codling moth Scentry traps, pheromone mating disruptors, and several possible codling moth sprays suitable for home gardeners from WSU Hortsense.
- Added Casoron pre-emergent grass and weed herbicide to allow for potential trials. (Note; Casoron is EPA labelled and label covers use near fruit trees- WSU mandatory requirements)