

Overview & Objectives

→ Establish baseline set of regionally adapted practices for the renovation and ecological management of neglected apple orchards in the North Central Region

OBJECTIVES:

- Determine most efficient strategies (time/technique) for renovating the structure of neglected and feral apple trees.
- Determine most effective strategies (time/technique) for topworking new varieties onto abandoned trees
- Explore techniques for boosting tree health with biological spray applications
- Explore techniques for boosting soil health with biological spray applications and increased organic matter

Steps

- 1. Define Production Goals
- 2. Orchard Analysis & Assessment (Site Conditions, Tree Health & Productivity, Genetics, Tree Structure)
- 3. Renovation Approaches & Pruning Regimes
- 4. Topworking Host Trees
- 5. Ecological Management Strategies

Define Production Goals

What will the end product be used for?

• E.g. fresh market sales, U-pick, fresh juice production, cider, scionwood generation, etc.



Orchard A & A

Site Conditions & Existing Vegetation

Analysis Questions:

- → Is the orchard overgrown?
- → Are other trees, shrubs, and wild vegetation growing there?
- → Does the orchard have perimeter fencing or is it Exposed to wildlife? Signs of wildlife?

Assessment Questions:

- → Do the site conditions require changing to suit the renovation project?
 - Coppice, thin, or remove undesireable trees and shrubs
 - Clear undergrowth, brushhog, flail mow,etc.
 - Fence trees or topwork above browse height

Orchard A & A

Genetics

Analysis Questions:

- → What is the genetic resource base?
- → Are the trees grafted, if so what cultivar(s)?
 - Are there visible signs of graft unions?
 - What rootstock(s) are the trees growing on?
- → Are the trees wild seedlings?

Assessment Questions:

- → Does the existing genetic resource base offer value pertinent to your production goals?
 - If the trees are grafted cultivars, then are they the cultivars you want to grow?
 - If the trees grafted on clonal rootstock, then is does the rootstock possess qualities you to carry on? i.e. dwarfing, fireblight resistance, etc.
 - If the trees are unnamed seedlings, then are they worthy of being grown for their fruit? Are they worthy as understock for introducing new cultivars?



Orchard A & A Cont.

Tree Health & Productivity

<u> Analysis Questions:</u>

- → Do the trees show signs of stress or disease? i.e. apple scab, CAR, firelight/non pathogenic stress factors, i.e. nutrient deficiency, drought, etc.
- → Do the trees currently support a diverse and healthy arboreal food web?
- → Do the trees have a high percentage of dead wood?
- → Are the trees currently producing? If so are the yields high, low, moderate?

Assessment Questions:

- → Does existing tree health pose any major limitations to your project?
 - Do diseased trees need to be removed altogether?
 - Can diseased wood be eliminated with pruning?





Orchard A & A Cont.

Tree Structure

Analysis Questions:

- → Have the existing trees ever been pruned?
- → Are there a high percentage of crossing branches, shaded wood, and shoots growing towards the interior of the tree?
- → Do the trees have a lot of new growth (1-2 yr old wood)?
- → Are there watersprouts visible on the trees?
- → Do the existing trees vary in age and degree of neglect?
- → What is the average tree height?

<u>Assessment Questions:</u>

- → What percentage of the trees require high, low, or moderate impact pruning?
- → Do canopies need to be 'lowered' to make fruit harvesting and overall management easier?



Formula...

Production Goals

+

Orchard Analysis & Assessment

=

Renovation Approach & Pruning Regime

Renovation Approaches & Pruning Regimes

Two Distinct Approaches:

→ maintain original varieties OR

→ topwork new varieties







Renovation Approaches & Pruning Regimes Cont.

Renovation Pruning of Original Variety Trees

The shape of each individual tree varies greatly in a neglected orchard—some trees have multiple trunks while others have single trunks with low branching and everything in between. The pruning for each tree becomes rather unique but follows some basic guidelines. Project goals will also influence the pathway to renovation particularly regarding final tree height.

- → Remove all dead/diseased wood immediately
- → Identify desirable tree height and top to that level
- → Thin canopy to increase overall air/light infiltration
- → Identify primary scaffolds, 4-8
- → Carry out renovation pruning over 2-4 seasons







Renovation Approaches & Pruning Regimes Cont.

Renovation Pruning of Host Trees

Renovating host trees is a more extreme pruning process, as the end goal is to have a tree that is entirely free of branches of the original genetics. Although similar to renovation pruning of original variety trees, this approach is typically faster and creates a more abrupt change.

- → Remove all dead/diseased wood immediately
- → Select 3-5 main scaffolds to develop into 'host limbs'
- → Head back 1-2 scaffolds each season for 2-4 seasons to create host limbs

NOTE on heading back scaffolds: consider pruning in a sequence that will not create breakage problems for grafted limbs down the road. E.g. head back uppermost limbs and graft those first, subsequently cuttings lower branches in following year.

Topworking Host Trees

- One or multiple cultivars
- Graft 2-3 host limbs (primary scaffolds) each season, maintain minimum of 1 'nurse limb'
- Techniques used: rind graft AKA bark graft, modified side bark graft*, cleft graft, whip/

tongue

Pre-topwork pruning

Topworking Host Trees Cont.

Rind Grafting

→ Timing: May-June

→ Advantages: high take rate, 80-95% EASY

→ Disadvantages: prone to breakage; graft upward side*























Topworking Host Trees Cont.

Cleft Grafting

→ Timing: Early April-May

→ Advantages: early season technique, doesn't require bark slipping

→ Disadvantages: wood prone to splitting, medium difficulty on 4"+ diameter wood











Topworking Host Trees Cont.

Whip And Tongue

→ Timing: Late April-June

- →Advantages: forms strong union— same diameter understock, easy to train; high take rate; secondary option to failed bark grafts
- → Disadvantages: challenging technique, difficult to position in tree











Apples Apples Apples More Apples!

Malus domestica

Malus	domest	5
_	Bonneso	-
Malus	comeso	C
Malus	domest	G
Malus	domest	a
Malus	domest	a
Malus	domest	d
Malus	domest	d
Malus	domest	
Investment Services	Contract of	-
Malus	pomess	-
Makus	domest	0
Malus	domest	a
Malus	domest	e
Malus	domest	a
Malus	domest	e
Malus	domest	a
Maks	domest	e
Malus	domest	d
Malus	domesti	
Malus	dom:	-
physicians	CONTROL	Ė
Malus	GOWNEST	44
Malus	domest	a
Malus	pomest	49
Malus	domest	c
Malus	domest	a
Malus	domest	¢1
Malus	domest	a
Malus	domest	0
Malus	domest	0
Malus	domest	
Malus	-	
SERVICE SERVICE	DOMEST	-
Malus	domest	NG I
Malus	pomest	9
Mahis	domest	G
Malus	domest	a
Malus	domesti	G
Malus	domest	cz
Malus	domest	ā
Malus	domest	d
Malus	domest	
Malus	domest	
Interior Parkets		
Malus	oomess	NG I
Malus	60mest	E1
Malus	comest	a
Malus	domest	0
Malus	domest	a
Malus	domest	¢,
Malus	domest	c
Malus	domesti	ex
Malus	domest	-
Malus	domest	-
Malus	domest	6
Invitations.	none section by	F
Malus	domest	-
Malus	domest	

ı	Malus	dom	657	Ä
	Malus	dom	-	é
	Malus	dom	457	é
	Malus	dom	esti	c
	Malus	dom	855	i di
	Malus	dom	est	6
	Malus	dom	450	k
	Malus	dom	440	
	Malus	dom	407	-
	Make	dom		
	Malus	dom		-
	Malus	dom	-	
	Malus	dom		-
	(Malanisma)	-		
	Malus	dom	450	4
	Makus	com	900	-
	Maks	Dom	-	4
	Malus	dom	490	
	Malus	com	457	16
	Malus	dom	400	C
	Malus	gom	457	4
	Malus	dom	est	c
	Malus	pom	457	4
	Malus	dom	es/5	c
	Malus	dom	455	¢
	Malus	dom	est	c
	Malus	dom	455	¢
	Malus	dom	eist	¢
	Malus	dom	450	c
	Malus	dom	65/5	¢
	Malus	dom	est	c
	Malus	dom	457	ŧ
	Malus	dom	est	k
	Mahis	dom	457	6
	Malus	dom	est	c
	Malus	dom	457	ė
	Malus	dom	esit	c
	Malus	dom	457	4
	Malus	dom	esit	c
	Malus	dom	450	é
	Malus	dom	esit	e
	Malus	dom	657	ie
	Malus	dom	esit	ė
	Malus	dom	est	è
	Malus	dom	465	e
	Malut	dom	445	ě
	Malus	dom	-	
	Malus	dom	-	-
	Malus	-	-	۰
	Malus	dom	_	-
	Malus	dom	in a	÷
	Malus	dom	-	-
	territorio de la compansa del la compansa de la com	in the same	-	ë
	Malus	dom	-	-
	Malus	dom		-
	Malus	gom	159	ΝĠ

CB	Apple
ca	Apple
ca	Apple
ce	Apple
Ca	Apple
CB	Apple
ica .	Apple
ica -	Apple
ica	Apple
CB.	Apple
ca	Apple
ica	Apple
ica	Apple
ica:	Apple
ca	Apple
ca :	Apple
ca	Apple
Ca-	Apple
ca	Apple
ca	Apple
CB .	Apple
ica	Apple
ca	Apple
ica .	Apple
ca	Apple
ca	Apple
co .	Apple
Ca .	Apple
ce	Apple
ica	Apple
Ca .	Apple
ca	Apple
ica	Apple
ica	Apple
ca	Apple
ca	Apple
ca	Apple
ica	Apple
ca	Apple
ce	Apple
ica	Apple
ice	Apple
ica	Apple
CB	Apple
ica .	Apple
ica:	Apple
ica	Apple
Ca .	Apple
ca	Apple
CB .	Apple
ica	Apple
G)	Apple
ica .	Apple
	min derivative and the second
CB	Apple

Brainburn

Macoun

Kingston Black

Blue Peanmain

Golden Winesap

Arkansas Black	1	John Bunker
Sweet Affred	1	John Bunker
Liberty	1	Marc Boone
Sweet Bough	3	Marc Boone
Jona Red	1 .	John Bunker
Early Strawberry	1	John Bunker
Citown Red	1	
Belle De Bookoop	1	John Bunker
Grimes Golden	2.	John Bunker
July Tart	1	John Bunker
Fieita	1	John Bunker
Cox Orange Pippin	1	John Bunker
Mutsu	1	John Bunker
Ashtoru Sitter	1	John Bunker
Cherango Strawberry	1	John Bunker
Yellow Transparent	1	John Bunker
Black Oxford	- 2	John Bunker
Reine De Pomme	1.	John Sunker
Dobinet	1	John Bunker
Chestnut Crab	1	John Bunker
Baldwin	1	John Bunker
Wickson	1	John Bunker
Roxbury Russet	1	John Bunker
Bird Road	1	
Trailman	3	John Bunker
Stoke Red	1	John Bunker
Bramley's Seedling	-	Geneva
Pine Gold Pippin	-	Geneva
Cherry Pearmain	-	Geneva
Yellow Newtown		Geneva
Esopus Spitzenburg	-	Geneva
Wealthy		Geneva
Wiresap	-	Geneva
Chestnut Crab		Geneva
Tolman Sweet	-	Geneva
Idared	-	Geneva
Empire	1.23	Geneva
Cortland	-	Geneva
Winter Sanana		Geneva
Sportan	-	Geneva
Northern Spy	10-4-1	Geneva
Honeygold	-	Geneva
Jonaned	-	Geneva
Jonagold	-	Geneva
Black Gill/flower		Geneva
Geneva	-	Geneva
Golden Nugget	-	Geneva
Forwhelp	-	Geneva
Ellison's Orange		Geneva

Geneva

Geneva

Geneva

Geneva

John Bunker

Deltas Baterians

tree A1, multigraft

tree A1, multigraft

tree A1, multigraft

tree A2, multigraft

tree A2, multigraft

tree A7, multigraft

tree A7, multigraft

tree A7, multigraft

tree A7, multigraft

tree A9, multigraft

tree A9, multigraft

tree A10, multigraft.

tree A10, multigraft

tree A10, multigraft

tree A10, multigraft

tree A11, multigraft

tree A12, multigraft, dead? tree A12, multigraft, dead?

tree A12, multigraft, dead?

tree A12, multigraft, dead?

tree A12, multigraft, dead?

2014 scion received

N

14

tree A10/11, multigraft

maybe dead?

tree A7/11, multigraft

tiree A4

tree A5

Ecological Management Strategies

Understory Management:

- → Scything/mowing schedule
- → Utilize rotational chop-n-drop technique
- →Introduce OM— woodchips, hay, etc.
- →Overseed soil-building seed mix (clover, daikon, chicory, etc.)









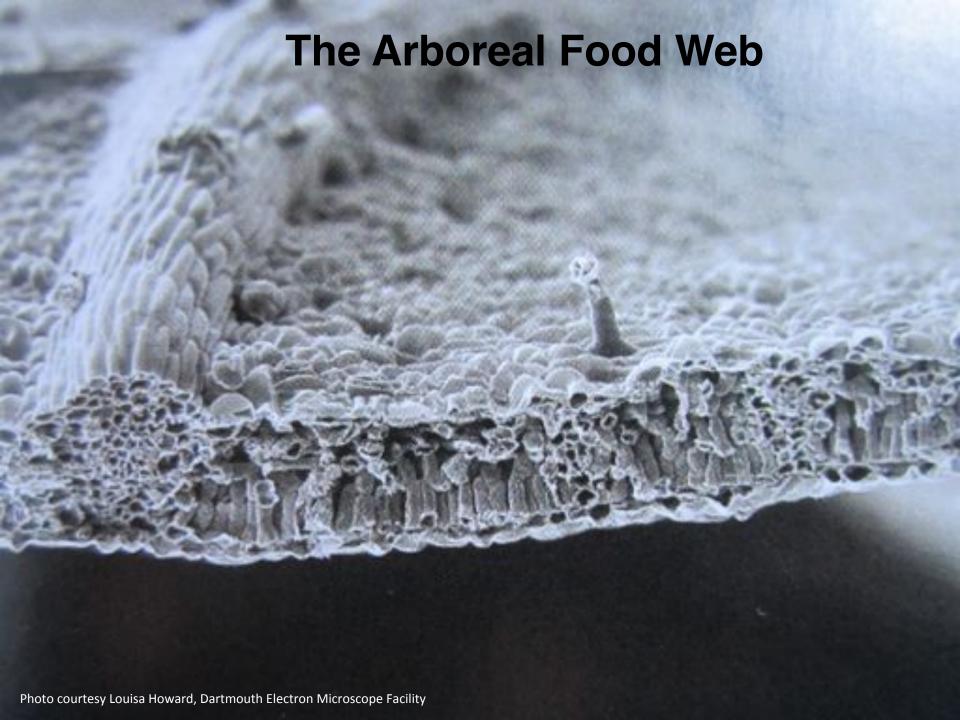




Ecological Management Strategies Cont.

Arboreal Food Web & Tree Health:

- → Spray aerated compost tea
- →50 gallon brewer, applied w/ backpack sprayers
- → Leaf tests analyzed by Soil Food Web, Corvallis OR







Leaf Organism Analysis

Report prepared for:

Roots to Fruits Mark Angelini 8150 Knot Rd

Report Sent:

Sample#: 01-117055

Unique ID: A6

Plant: Apple

design@rootstofruits.biz

Clarkstin, MI 48348 USA

Invoice Number: 0 Sample Received: 8/1/2013 For interpertation of this report please contact:

Earthfort Labs info@earthfort.com (541) 257-2612

Consulting fees may apply

			Percent Leaf Surface Covered By:					
Sample Number	Unique ID	Plant Assayed	Sactoria	St. Dev.	Fungi	St. Dev.	Total Coverage	Comments
01-117066	A6	Apple	52	44.6	5	6.21	57%	Inadequate Coverage

St. Dev means standard deviation of the separate measurements made per the three to five leaves sent in the sample

We have found that a minimum of 60 to 80% coverage (sum of both bacterial and fungal coverage, if at least 5% is fungal coverage) can prevent disease significantly.

Notes:

90% of bacteria observed on the upper surface of leaf. 82% of fungi observed on the upper surface of leaf.



Leaf Organism Analysis

Report prepared for:

Roots to Fruits Trevor Newman 8150 Knox Rd Clarkston, MI 48348 USA

Report Sent: Sample#: 01-121670 Unique ID: A6

Plant Apple

Invoice Number: 0

design@rootstofruits.biz Sample Received: 9/11/2015

For interpertation of this report please contact:

Earthfort Labs info@earthfort.com (541) 257-2612

Consulting fees may apply

			Percent Leaf Surface Covered By:						
Sample Number	Unique ID	Plant Assayed	Bacteria	St. Dev.	Fungi	St. Dev.	Total Coverage	Comments	
01-121670	A6	Apple	41	36.9	28	23.6	89%	Adequate Coverage	

St. Dev means standard deviation of the separate measurements made per the three to five leaves sent in the sample

We have found that a minimum of 60 to 80% coverage (sum of both bacterial and fungal coverage, if at least 5% is fungal coverage) can prevent disease significantly.

Modes:

Bacteria 89% upper surface, 11% underside. Fungi 80% upper surface, 20% underside.

Next Steps...

- Continue evaluating graft growth rates, pruning techniques, productivity, etc.
- Explore pruning/training techniques for grafts
- Maintain original varietal trees with routine pruning
- Propagate successful varieties
- Assess T-budding and chip budding as viable top working methods
- Renovate more orchards & find more projects







