

Permaculture on Organic Farms

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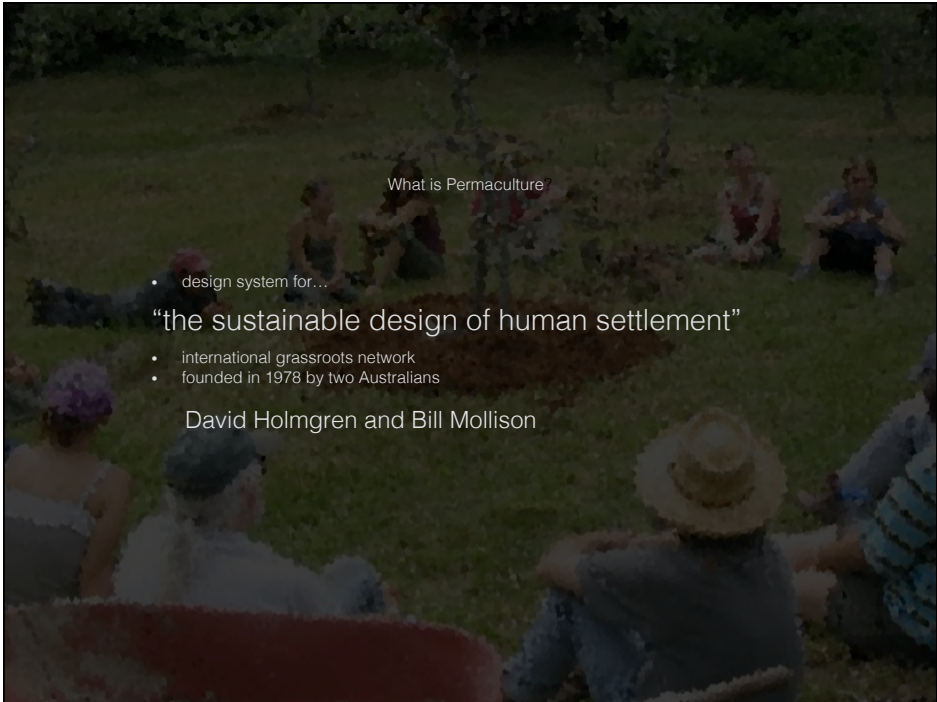


Ron Revord



Permaculture for US Farms: Strategies for Diversification

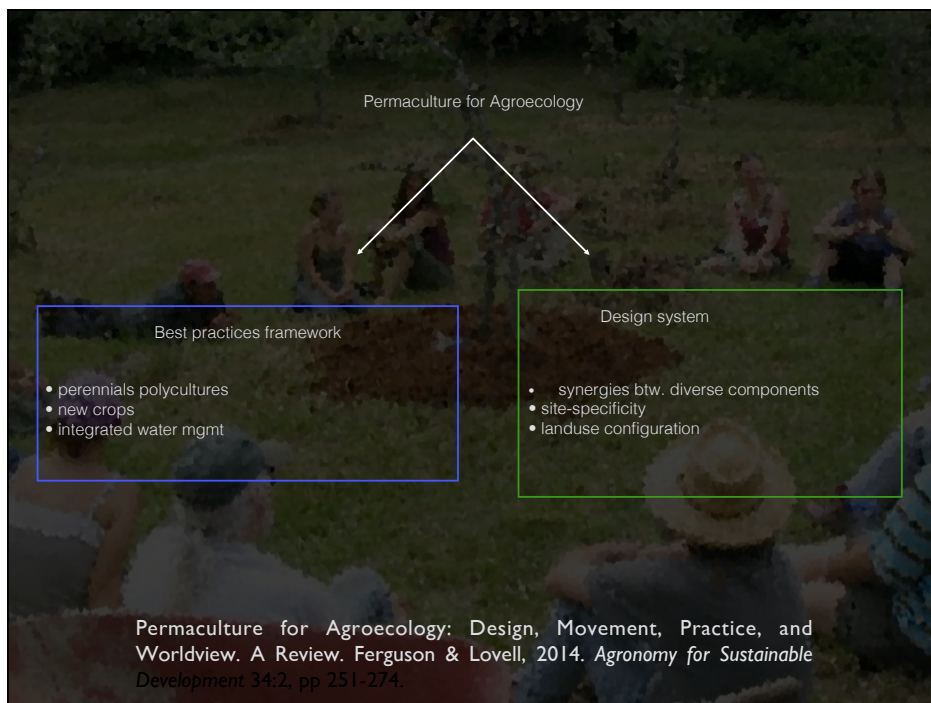
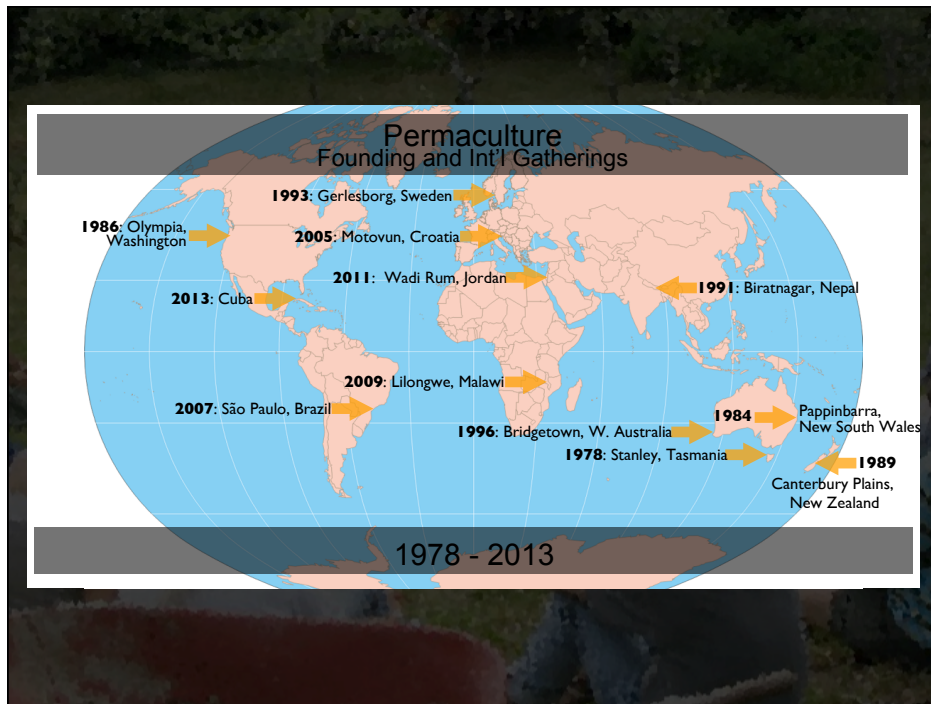
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What is Permaculture

- design system for...
- “the sustainable design of human settlement”
- international grassroots network
- founded in 1978 by two Australians

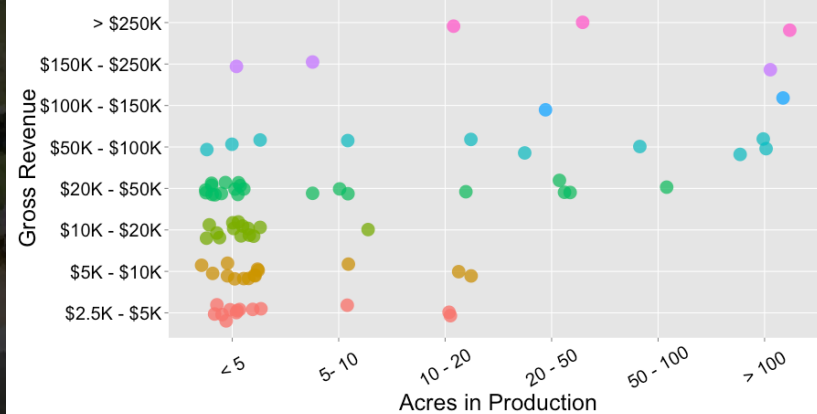
David Holmgren and Bill Mollison

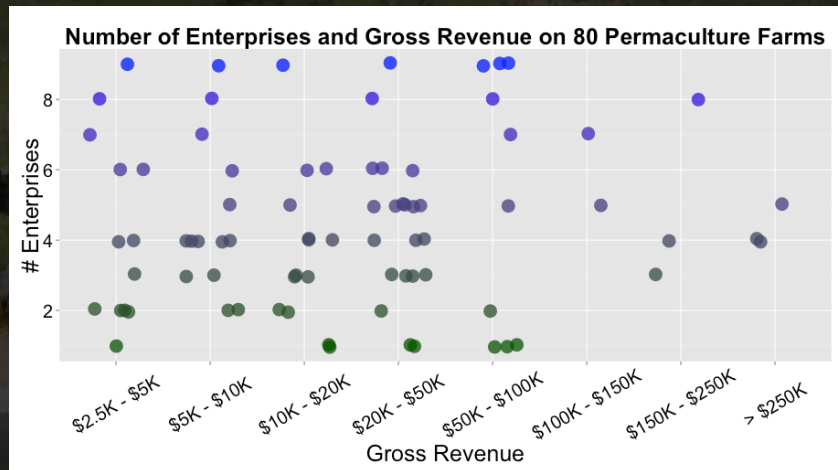


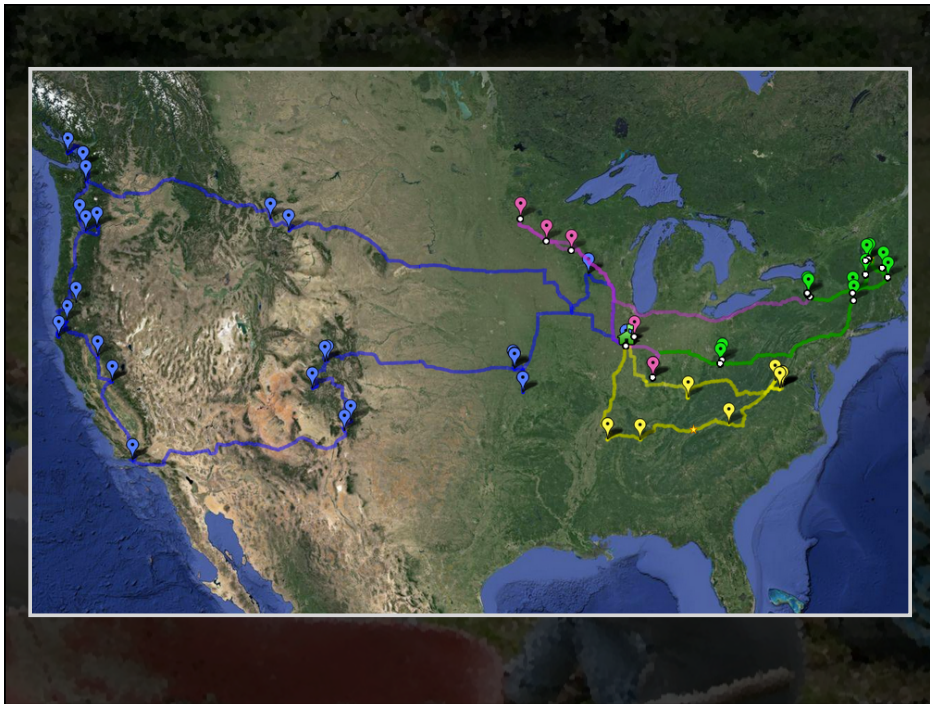
Permaculture Farms in the US



Farm Size and Gross Revenue on 80 Permaculture Farms







science framework

- perennials polycultures
- new crops
- integrated water mgmt

A photograph showing a dirt path that stretches into the distance, flanked by rows of mature olive trees. The scene is bathed in warm, golden light, suggesting late afternoon or early morning. The trees have thick, gnarled trunks and dense, silvery-green foliage.

A photograph of a field filled with young trees and plants. Several wooden stakes are placed in the ground, likely to support the young trees. The plants are lush green, and the background shows a line of trees under a clear sky.



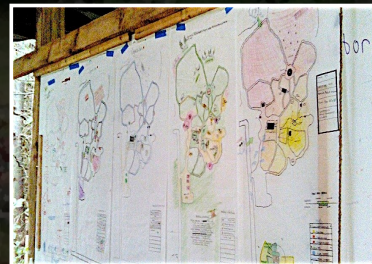
Design system

- synergies between diverse components
- site-specificity
- landuse configuration

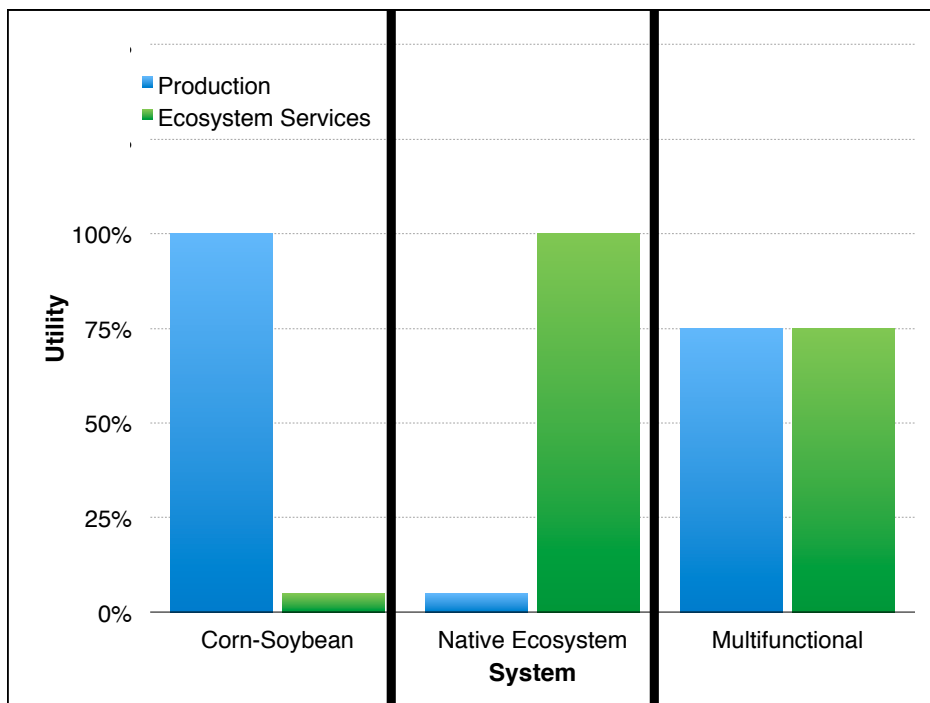


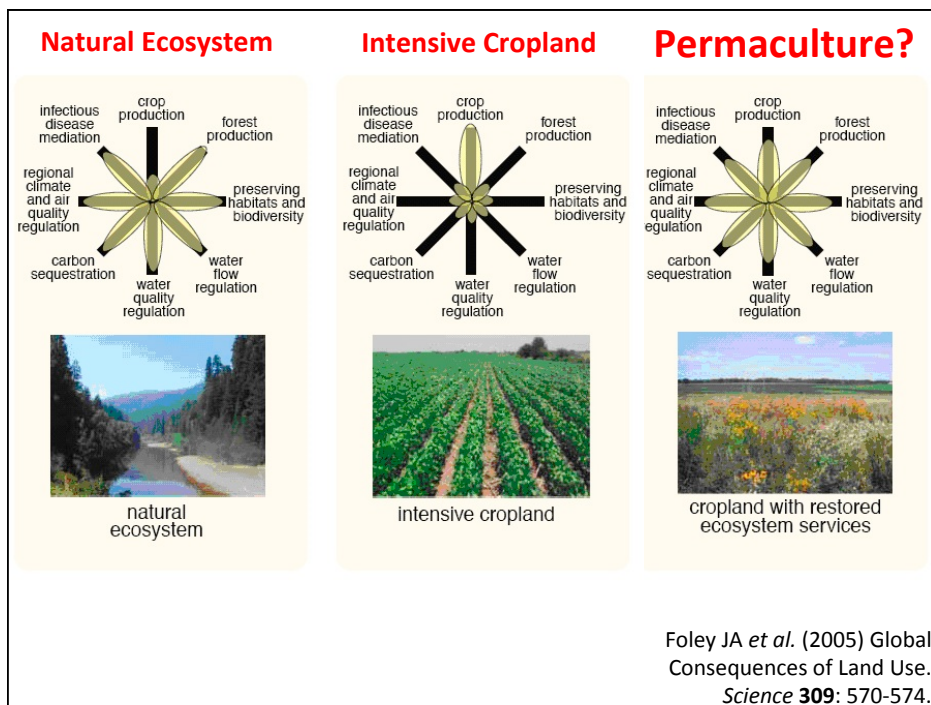
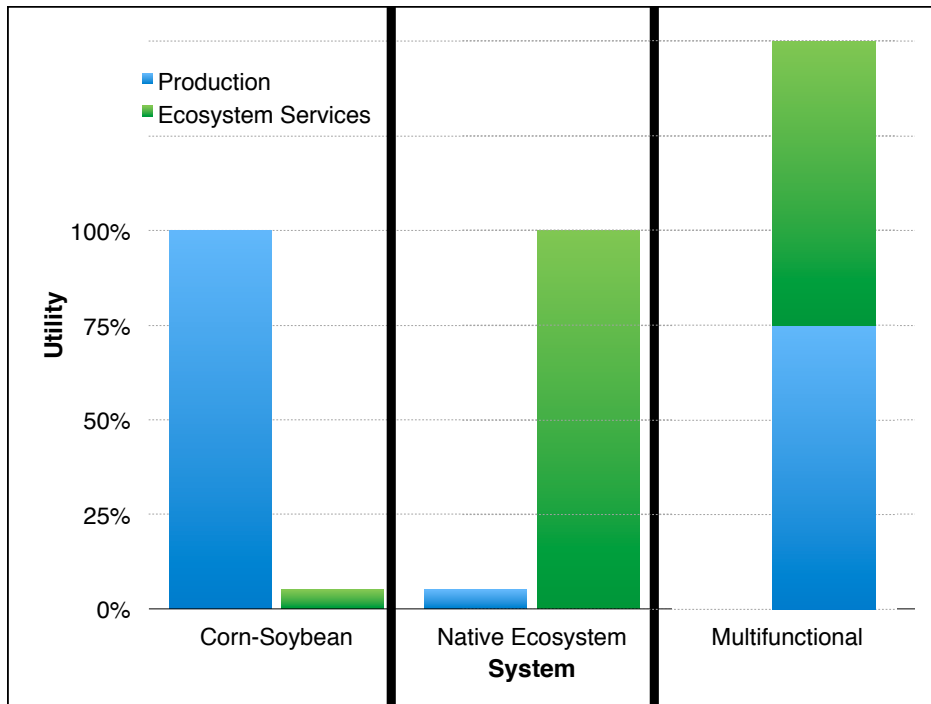
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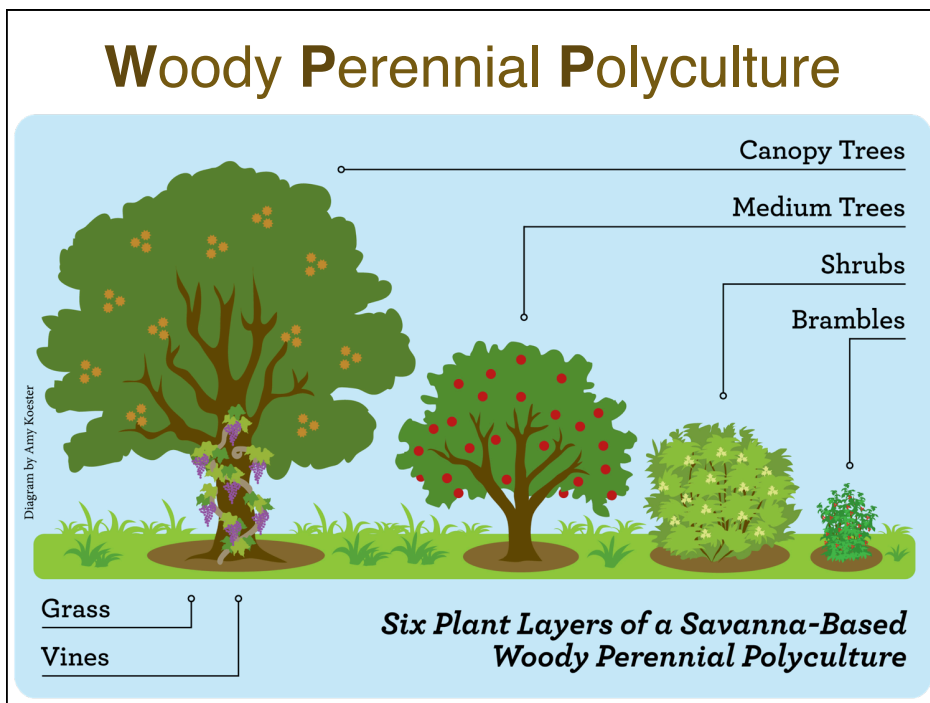
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- site-specificity
- landuse configuration











Biogeochemistry

Carbon

Can a WPP stabilize seasonal carbon fluxes, resulting in higher long-term carbon sequestration than a CSR? Will this storage primarily take place both in woody biomass and/or in soil organic carbon?

Nitrogen

Can a WPP system reduce nitrous oxide (N_2O , an important greenhouse gas) emissions? Can a WPP reduce nitrate leaching or runoff? Can the WPP system supply its own nitrogen needs by fostering healthy soil ecology?

Water

What is the water use efficiency of the WPP system? From how deep are the WPP plants getting their water? How susceptible is a WPP to a drought? Can a WPP reduce surface water runoff and soil erosion?

Ecology

Biodiversity

Can a WPP increase insect, avian, and/or soil microbe biodiversity? How closely will returning biodiversity match the composition of native savanna or prairie ecosystems?

Phenology

How long is the WPP's growing season? When are the major harvest events? How susceptible is the system to early or late frosts? How can an extended growing season affect the ecological and physical properties of the system?

Resilience

Will WPP productivity be more resilient to seasonal and inter-annual variation in resource availability than that of a CSR? What drives this resilience? How susceptible is a WPP to insect and disease damage?

Economics

Yield

How does the potential yield of a WPP compare to a CSR? What is the nutritional composition of the suite of harvested crops? What are the potential biomass, grain, or livestock yields from the alleys?

Profitability

What do the long-term economics of a WPP system look like? How quickly can the large initial investment in trees be recovered? How does the annual profit compare to that of a CSR? How sensitive are profits to economic and ecological fluctuations?

Inputs

What non-renewable inputs are required to establish and maintain a WPP system? Does the system require fertilizers, herbicides, pesticides, or fossil fuels?

Agronomy

Establishment

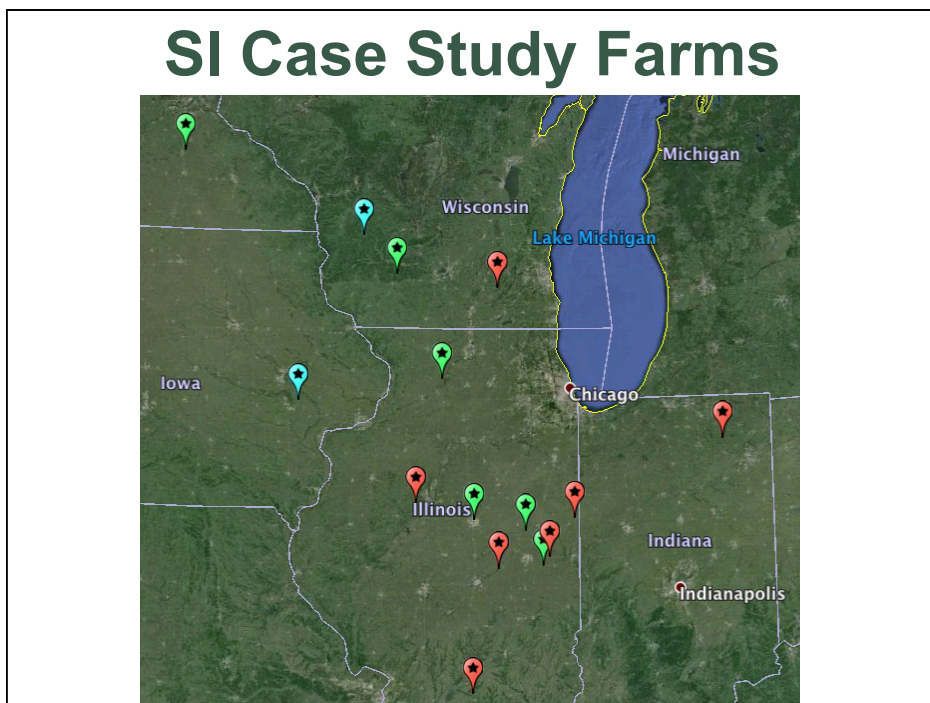
What is the best method to establish a WPP? What herbicides can be used in the system, and how can they be used most effectively? Is irrigation necessary? What is the best way to establish the alleys? What soil amendments are necessary?

Maintenance

What are the annual maintenance requirements of a WPP system? Is any special equipment required? How much labor is required? What special knowledge is required? How sensitive is the system to mismanagement?

Harvesting & Processing

How much labor does it take to harvest a WPP by hand? Can we adapt equipment to mechanically harvest certain crops? What are the best ways of processing the nut crops? Can we utilize existing processing infrastructure?



What are farmers planting?

Species	Amount	Species	Amount
Currant	11175	Pawpaw	475
Hybrid Hazelnut	9975	Shagbark Hickory	375
Raspberry	5425	Red Cedar	350
Hybrid Poplar	2850	Black Walnut	325
Chinese Chestnut	2600	Black Locust	300
Apple	1700	Hardy Kiwi	275
Blackberry	1625	Persimmon	275
Serviceberry	1400	Mulberry	250
Grape	1275	Pecan	225
Elderberry	1200	Cherry	200
Gooseberry	1175	Cranberry	100
Aronia	1000	Peach	175
Plum	775	Sugar Maple	100
Hybrid Chestnut	725	White Pine	100
Pear	725	Apricot	25
Oak	575	Butternut	25

Two Core Crops

Chestnuts
“Corn on Trees”



Hazelnut
“Soy on Trees”

Focus Crops for the Midwest

Present challenges for cultivar and market development

Chestnut (*Castanea sp.*)

- Much of the work on this crop can be found at the following links:

[Michigan State University](#),
[University of Missouri](#),
[Penn State University](#),

North Carolina State University
and [The American Chestnut Foundation](#).

- Presently, viable cultivars and extension reports on BMPs are available but limited. Germplasm development work for disease resistances (blight and root rot) is still an ongoing focus.



Hazelnut

(*Corylus* sp.)

[Oregon State University](#) [GRIN](#)
[Rutgers University](#)
[UW-Extension \(UMHDI\)](#)
[The Arbor Day Foundation](#)



Currant

(*Ribes* sp.)

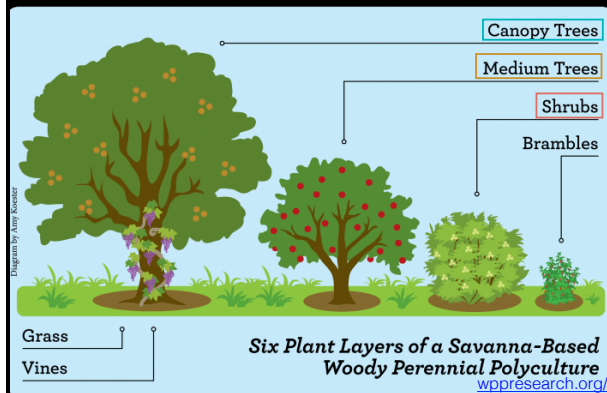
- Focal entities:

Oregon State University ([GRIN](#)),
[Guelph University](#),
[Cornell University](#).

- Plant material and management practices are abundantly available. The plant's utility in polyculture settings is less known but may intercrop well shaded areas



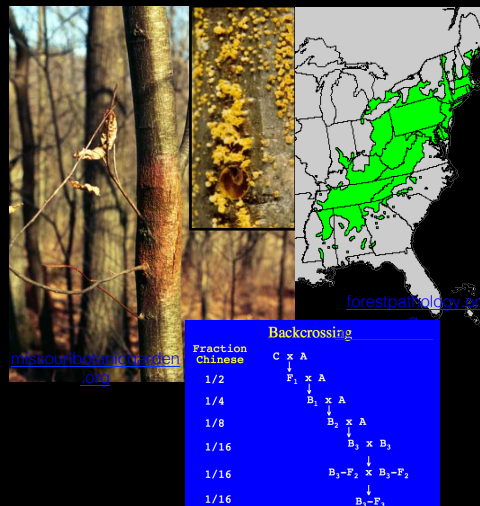
Other potential supporting crops



Chestnuts in the U.S.

Cultivar Challenges and Work

- Chestnut blight (*Cryphonectria parasitica*)
- Source resistance and [backcross](#)
- Root rot (*Phytophthora cinnamomi*)
 - Combined effort between [TACF](#), [Clemson](#), and [NCS](#)
 - Generate seedling pools containing root rot resistance
 - Add root rot resistance to blight resistance plants
- [Internal kernel breakdown](#) (IKB)



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Chestnuts in the U.S.

Market Challenges and Work

- Moving past infancy ([journal articles](#)).
- “A majority of producers have been in business less than ten years and trees are just entering commercial productivity.”
- “Around 1.5 million lbs. of production in the U.S.” (2011).
- Two summaries of the state of U.S. Chestnuts.
- [Warmund, M. R. Chinese Chestnut \(*Castanea mollissima*\) as a Niche Crop in the Central Region of the United States. \(2011\). HortScience, 46: 345-347.](#)
- [Chestnut Marker Analysis: Producers Perspective](#)



Chestnuts in the U.S.

Market Challenges and Work

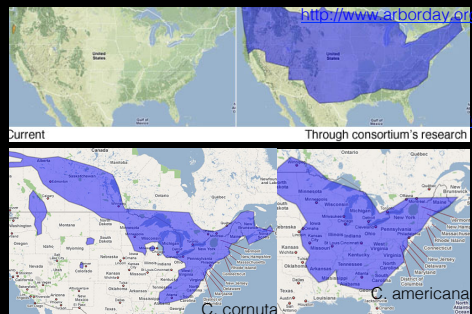
- [Chestnut Growers, Inc.](#)
 - Cooperative aggregator and processor
- Enterprise budget tools & resources
 - [Before getting started](#) (MSU)
 - Cost of [production tool](#) (MSU)



Hazelnuts in the U.S.

Cultivar Challenges and Work

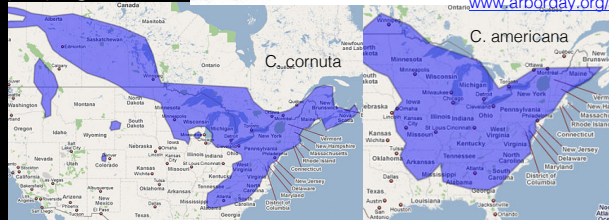
- Eastern Filbert Blight (EFB)
(*Anisogramma anomala*)
- NW vs. MW vs. NE
- [Hybrid hazelnut consortium](http://www.arborday.org/)
- Winter hardiness
- Plant trait uniformity and propagation



Hazelnuts in the U.S.

Cultivar Challenges and Work

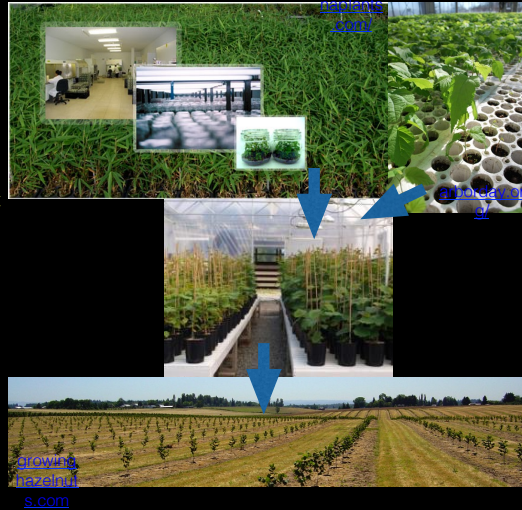
- Eastern Filbert Blight (EFB)
(*Anisogramma anomala*)
- Winter hardiness
- Needed for NW and NE cultivars to transfer to the MW
- Plant trait uniformity and propagation



Hazelnuts in the U.S.

Cultivar Challenges and Work

- Eastern Filbert Blight (EFB) (*Anisogramma anomala*)
- Winter hardiness
- Plant trait uniformity and propagation
 - Tissue cultivar is available for a select group of viable NW cultivars developed at OSU.
 - Hybrids in the MW and most accessions in the NE do not yet have commercial viable asexual propagation.
 - Plants available for purchase in the MW and NE are typically grown from seed generate from narrowly selected parent plants.



Hazelnuts in the U.S.

Cultivar Challenges and Work

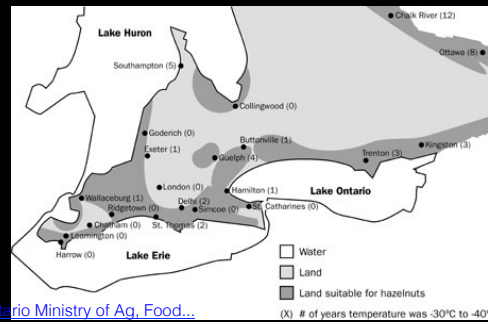
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Hazelnuts in the U.S.

Market Challenges and Work

- The chicken before the egg...
- Upper Midwest Hazelnut Development Initiative
 - American Hazelnut Company
- [Ferreo in Ontario](#)
 - 900,000 sq. ft. industrial food facility that imports 12 million lbs. of hazelnuts annually.
 - Other business local to Ontario purchase \$ 5 million in hazelnut annually.
 - University of Guelph & [Dr. Adam Dale](#).
 - [Ontario hazelnut association](#)



[Ontario Ministry of Ag. Food...](#)

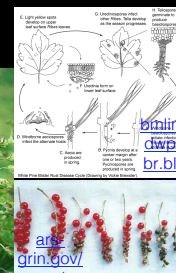
Currants in the U.S.

Cultivar Challenges and Work

- Cultivars are readily [available](#) for NA
- Major diseases have been addressed (WPBR & PWM). Bans still exist in 12 states
- Some cultivars cater to specific markets (i.e. juice, culinary ingredient, whole fruit, wine etc.)
- A broad spectrum of information is available at [GRIN](#)
- European production is steady
 - 1017 t in 2005
- *Ribes* potential in American markets
 - [Adam Dale \(2000\)](#)



[UW-extension @ Bayfield](#)



[UW-extension @ Bayfield](#)

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Agriculture Program](#) Scholar



- Find all upcoming and archived webinars at <http://www.extension.org/pages/25242>.
- Find the slides and recording for this presentation at <http://www.extension.org/pages/71918>
- Have an organic farming question? Use the eXtension Ask an Expert service at <https://ask.extension.org/groups/1668/ask>
- We need your feedback! Please respond to an email survey about this webinar which you'll receive later.
- Thank you for coming!

