An Agroecological Restoration Case Study: Oregon Hazelnut Orchards

Using seed-based restoration to improve orchard systems and utilize land sharing

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All research from this presentation has been conducted on Lane-Massee Farms

Ecological Background

- Willamette Valley (OR) Ecosystems
  - Not many left remain intact
  - Large push for oak-related restoration
- Hazelnut Ag vs. Oak Conservation
  - Filbertworm
  - Space
- Can we meet in the middle with the resources we have today?
  - Meet the needs of the ecosystem and the needs of the farmers

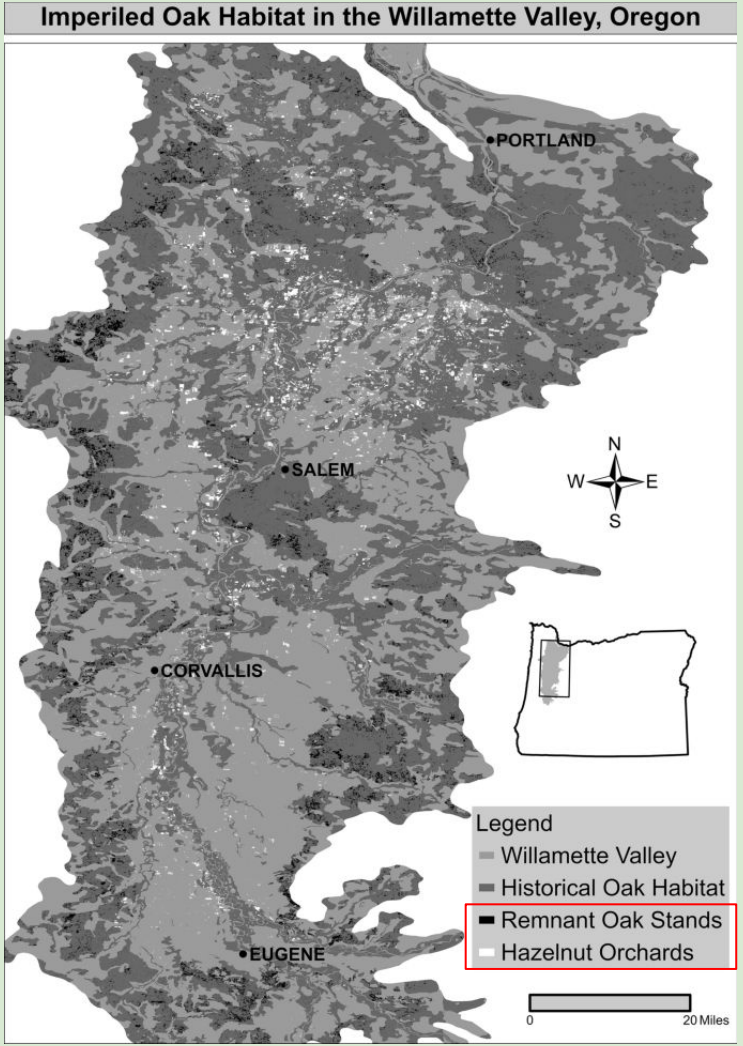


Figure by Cal Penkauskas, 2019

Standard Orchard Practices

- Many orchard systems across the Western U.S. use bare-soil management practices to prepare for mechanical nut harvest
  - Herbicide spraying, ground scraping, mowing, etc.
- In Oregon, where hazelnuts are the primary nut crop, most orchard managers utilize all of these practices
- Cover crops are considered a “no-no”

Conservation cover after mowing in late summer

Barriers to Effective Cover Crops

- Why do orchard managers keep the understory free from vegetation?
  - Crop loss during harvest due to nut entanglement
  - Cover crop height and associated orchard management difficulties
  - Cost, management, and implementation of cover
  - Lack of technical support
- But is there a “cover crop” that avoids most of these issues?

A Lesson Learned

Past & Present Work

- Small Pilot Project 2019 - 2021
  - Test viability for different cover crops in hazelnut orchards
  - Can these cover crops handle standard management?
- Expanded Pilot 2022 - 2023
  - Test a robust native seed mix designed for hazelnut orchards
  - How long can these cover crops last?
- Multi-Orchard Project 2024 +
  - Test multiple seed mixes across multiple orchards & canopy densities
  - How do other farmers like the cover?
  - Economic feasibility

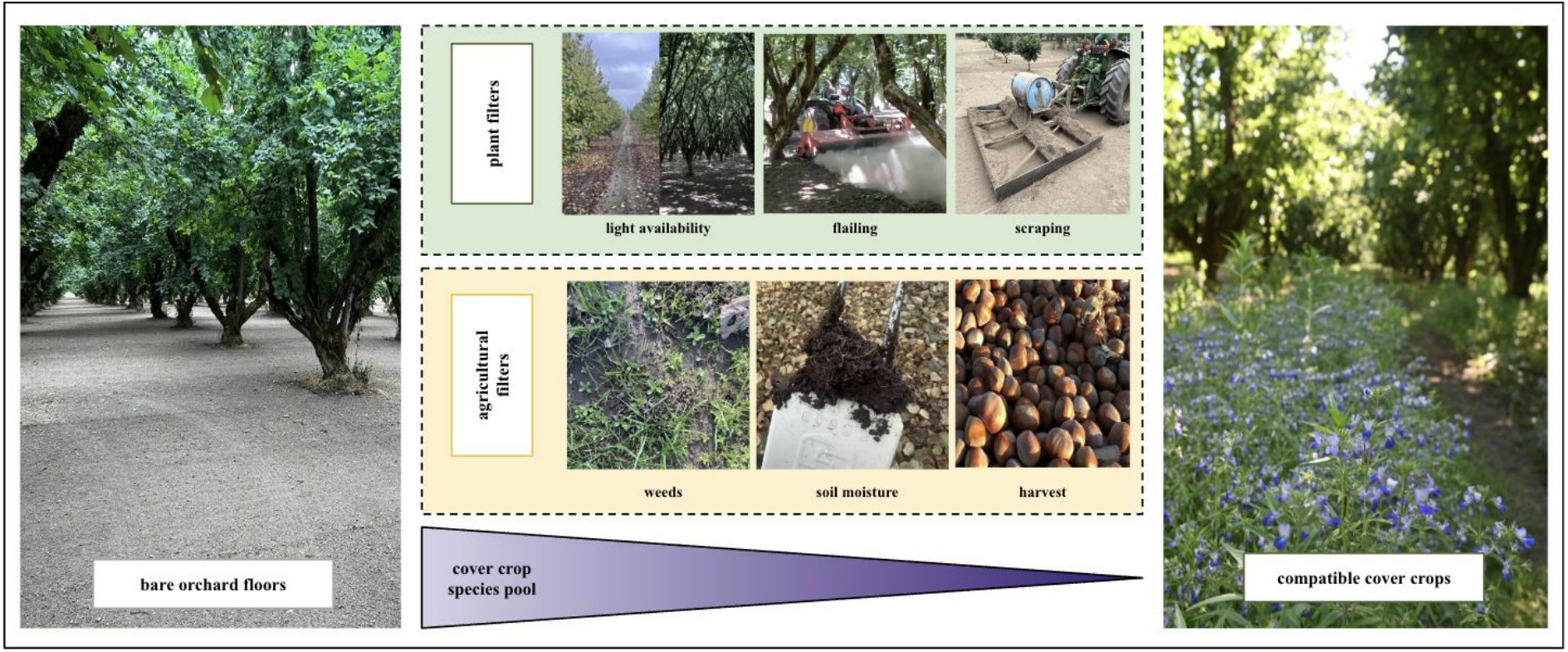
Seed Selection for Agroecological “Restoration”

- Filter criteria:
  - **Orchard survival** ———————> what species will survive in the given orchard system?
    - Select species that can survive in the select sun-shade ratio and are competitive towards weeds when in a semi-invaded community





General Species Pool Filtering Method



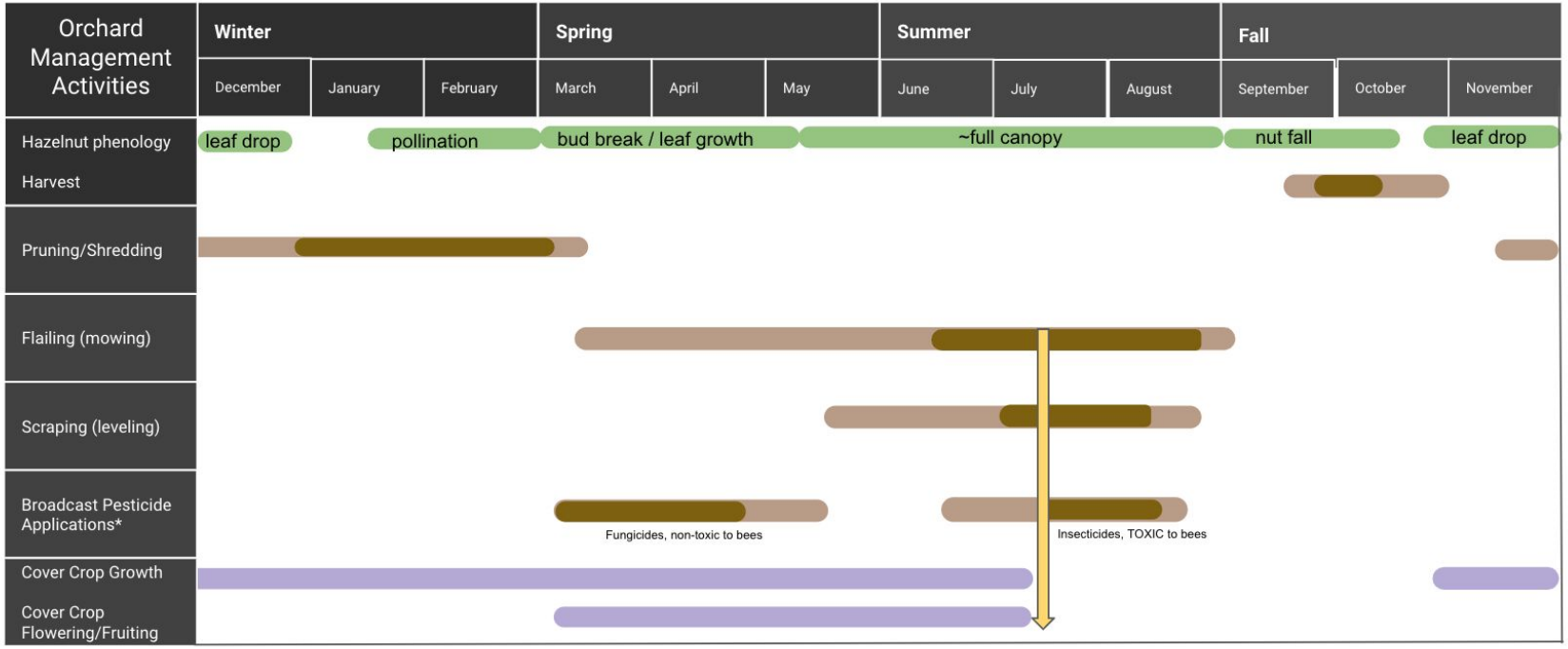
Seed Selection for Agroecological “Restoration”

- Filter criteria:
  - **Management timeline** —---> when do certain management activities take place?
    - Select species that can handle intense disturbance, but are dormant or in vegetative stages for especially important activities (like harvest or required spraying)





Timeframe for Orchard Management and Cover Vegetation



= allowable timeframe

= typical timeframe

= first mow deadline (must happen prior to second round of broadcast applications)

*other viable forms of pest management are available to growers, including different forms of pesticides and different application practices. This visualization depicts current common practices and timelines.

Conservation Cover vs. Conventional Cover

Cover Type	Pros	Cons
Conventional • Oats • Wheat • Vetch • Clover • Radish	• Inexpensive (~$100/acre) • Lots of available seed	• Height • Harvest entanglement • Need to reseed • Phenology
Conservation • Phacelia • Prunella • Geum • Collomia • Lomatium	• No harvest entanglement • Self Sustaining • Phenology	• Expensive (~$1000/acre) • Not a lot of available seed

Native Cover

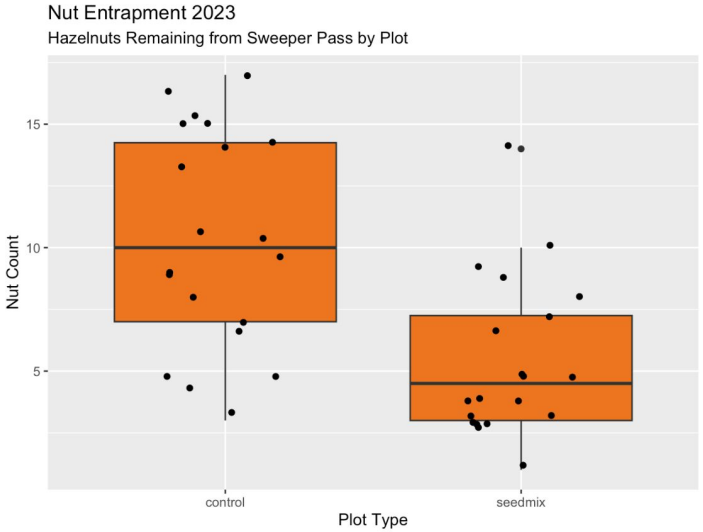
Pilot Project 2019 - 2021

Conventional Cover

Why Conservation Cover?

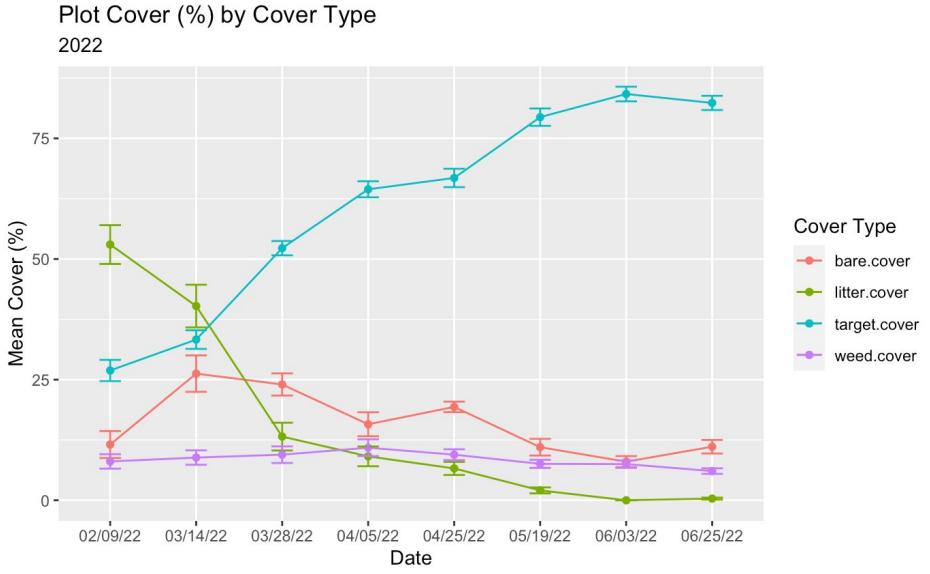
Through our pilot research, we have found that:

- Native plant phenology matches management cycles of hazelnut agriculture better than conventional cover cropping phenology
- This matched phenology is perfect for nut harvest: bare ground during dry harvest years and minimal vegetation regrowth during wet harvest years
    - Equal crop loss in dry years, conservation cover facilitates less crop loss in wet years



Why Conservation Cover?

- Through our pilot research, we have found that conservation cover:
  - Can compete with weeds for ~85% plot cover dominance
- Can grow in heavily shaded areas where conventional cover crops cannot
- Can handle much more disturbance than conventional cover
- Has all the ecological benefits of conventional cover crops + more

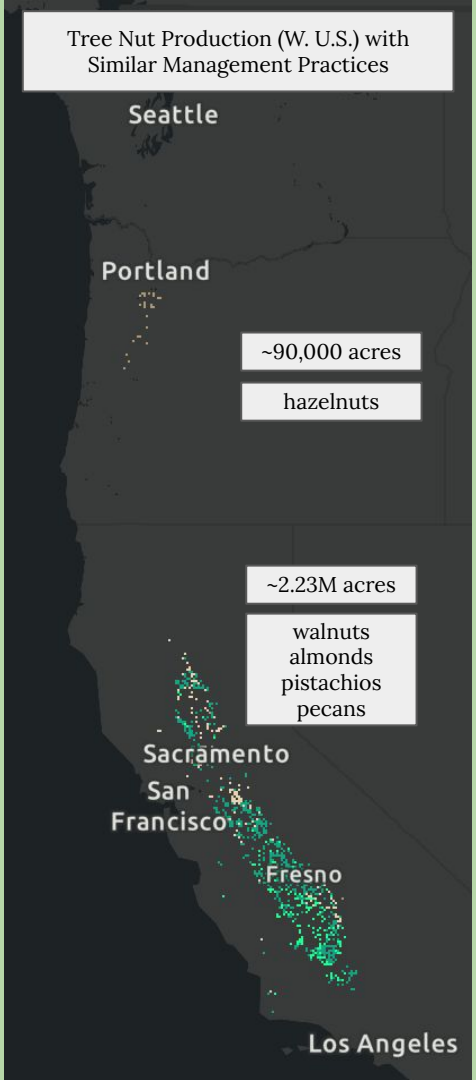


Orchard Systems: Perfect for Land Sharing

- Many orchards are already void of vegetation
  - These orchard systems may only need bare ground once a year
- Many orchards would benefit from numerous ecosystem services
  - additional pollinator habitat
  - soil health benefits
- Shared space for native diversity that is actively managed without additional input from farmers

Broader Impacts

- Improve orchard systems to help farms economically and ecologically
- Improve conditions for surrounding ecosystems
- If adapted across many different orchard types, could vastly increase native flora and fauna habitat across Western U.S.
- Seeds could be sold to dramatically increase amount of available seed for restoration practitioners




Thank You!
Questions?