Willamette Basin Hazelnut Resource Stewardship

Assessment Report

Oregon Solutions | April 2020

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Acknowledgements
Oregon Solutions greatly appreciates all those who generously gave their time to inform this assessment and report.

About Oregon Solutions
Oregon Solutions came into being with the passage of the Oregon Sustainability Act in 2001. It is the state of Oregon's designated program to help communities address challenging community-based problems and opportunities through collaborative approaches. We do this by creating a neutral forum where businesses, governments, nonprofits, community-based organizations, sovereigns, and other stakeholders can come together to align resources and pool efforts to achieve desired results using collaboration.

Oregon Solutions' engagement starts with an *assessment*. When invited, Oregon Solutions begins an assessment to explore whether and how a collaborative approach might be structured to address a particular community issue. The assessment is composed of a series of one-on-one or small group interviews. If an assessment finds there is a project that can benefit from an Oregon Solutions engagement, it will go to the Oregon Governor for consideration of a designation as an Oregon Solutions project.

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PURPOSE

Oregon Solutions conducted this assessment at the request of staff at the Eugene Water and Electric Board. The goal of the assessment was to determine if the conditions were present for an Oregon-Solutions-like collaborative process across the Willamette Basin that would involve hazelnut orchard management and complement watershed stewardship goals. Oregon Solutions evaluated whether there was interest among stakeholders to support and incentivize hazelnut growers to implement practices that protect water quality. Such efforts would build on the success of the following pilot projects:

- In the mid-Willamette Valley, the Natural Resources Conservation Services and conservation districts have been working in Marion, Polk, Yamhill, and Washington Counties to incentivize the use of vegetative cover between rows of hazelnut trees in orchards and at field edges. The cover minimizes soil erosion and levels of pesticide that can bind to soil particles and be carried off site during erosion. Working collaboratively, these organizations are offering financial incentives to encourage growers to protect their orchards from winter erosion.

- Eugene Water and Electric Board has been working for eight years to test pest mitigation and management strategies in hazelnut (filbert) orchards. Their partnership with the Natural Resources Conservation Service, Oregon State University, and growers has proven effective in reducing crop damage from filbert moths. This has reduced reliance on heavy pesticides and is improving water quality—a benefit for downstream water users and the environment. Known as the McKenzie River Basin Growers Moth Monitoring Project, they have used field staff to place traps to identify specific times when pesticides should be applied to combat filbert moth pressure. This approach has led to a 65 to 75 percent reduction in the use of pesticides in their project area.

This assessment evaluated the level of interest across the Willamette Basin, particularly where hazelnut acreage overlaps with drinking water source areas, to improve water quality through a coordinated effort. This effort could result in the following:

- Shared data collection
- Mapping of moth migration patterns
- Support for a Natural Resources Conservation Services Regional Conservation Partnership Program application
- Support for monitoring efforts for a third-party certification program

This report reflects the findings from our assessment interviews.

METHODS

Between December 2019 and March 2020, Oregon Solutions interviewed more than twenty stakeholders from organizations representing key interests related to hazelnuts, orchard

management, and water quality. Interviewees included growers, processors, crop advisors, commission and industry office staff, public and private sector field staff, researchers, regulators, and business people. Interviews were conducted in-person, or by phone or email. The assessment team also gleaned information from research presented at hazelnut events. Oregon Solution's goal with assessment interviews is to have interested parties recognize that their perspectives and interests are represented and considered in developing a potential collaborative process. A list of those interviewed and their affiliations can be found in appendix A.

Before each interview, individuals were briefed about the purpose of the assessment. All interviews were voluntary and lasted thirty to sixty minutes. Interviewees were informed that the final report would aggregate responses into key issues without individual attribution.

BACKGROUND

Hazelnuts are a treasured and valuable Oregon crop having a $150 million total annual impact in Oregon. They became the official state nut in 1989. Since 2015, the industry has experienced a boom, with the number of orchards growing by 50 percent. Now there are nearly 1,000 hazelnut farms in Oregon totaling 80,000 acres. (More than half of current orchards are less than five years old.) A hazelnut tree can produce for more than 100 years. Today, Oregon grows 99 percent of all hazelnuts produced in the United States, and that production is expected to double by 2025. With an increasing foothold in export expansion beyond its five percent of the current global market share, growers have found opportunities to increase bulk sales and value-added products domestically and internationally.[1]

As Oregon's economy benefits on multiple levels from the hazelnut industry, production, in turn, relies on multiple actors to steward soil and water and support natural resources and land uses for the long-term stability of orchard production. For example, growers are looking for techniques to improve production where there is environmental degradation, challenging topography, lack of soil stability, runoff, and incompatible land uses. Orchard owners and conservationists see mutual gains from investments in processing and orchard management strategies that have created a strong network of interdependence. That network can continue to see returns for many years to come if stewardship continues to diversify, be adaptive, and be defined broadly across the basin.

Some of Oregon's hazelnut orchards are certified organic. They represent just one percent of crops compared to conventional orchards, but there is an upward trend in adoption of organic practices in step with market growth especially among smaller, family-owned farms. This segment of the hazelnut industry is supported by the Oregon Organic Hazelnut Cooperative, which was formed in January 2017. It is a grower-to-grower network that works to share and differentiate the holistic nature of farming practices through

[1] The primary competitor for Oregon's growing hazelnut industry is Turkey, which produces 70 percent of the world's hazelnuts.

promotion, production, and distribution of products and best practices.[2] Organic hazelnut crops can garner up to $10 to $15 more a pound than conventional counterparts. Value-added markets are also building for organic hazelnuts, with Oregon products seeing promise in butters, milk, and confectionaries tailored to consumers willing to pay more for organic products. These orchards bring significant benefits to the broader hazelnut industry as they are constantly testing and sharing new techniques to increase the sustainability and efficiency of soil and water resources. This work can be informative for partners looking for early adopters of stricter conservation measures.

The Oregon hazelnut industry has invested in research to build an industry-wide understanding of policy and production mechanisms to ensure crop resilience. Changing conditions in the natural world, as well as layers of regulatory and economic disruption, bring uncertainty from one season to the next. Research can help growers weather those risks. For example, in 2018 the hazelnut industry partnered with Oregon State University's hazelnut breeding program[3] to get a handle on the eastern filbert blight—a pervasive fungal disease that can threaten hazelnut production. The university's expedited experimentation through genetic breeding led to a more resilient tree that was resistant to the blight. Researchers found that once blight-resistant trees were planted, management interventions like pruning, fungicides, and resistant cultivars helped further protect trees from eastern filbert blight. Oregon State University's hazelnut-breeding programs started in the 1920s and are world class, conducting 95 percent of hazelnut-breeding programs to advance genetic controls for new sources of resilience in Oregon and beyond. This partnership has helped the industry survive crises and is positioned to continue to do so as new threats arise.

On the horizon, the industry and their partners will likely be dealing with a series of environmental issues that might come as industry expands its footprint and creates a more uniform, monoculture crop. The spread of pests and seasonal threats in particular can impact the soil and water resources that support orchard resilience. Industry and partners have the potential to mitigate risks through coordinated efforts of pest monitoring, planting of more permanent vegetative covers, and diversification of crop breeds, and different management approaches. There is continued movement in the industry toward experimentation with widespread application of best practices to build crop resilience to increase productivity and mitigate risks. An example of these efforts is the Stewardship Certificate Program that Oregon State University is developing to track production and stewardship practices through self-reporting. The pilot aims to expand participation leading to more data and best practices on restorative practices within the hazelnut industry.[4] For a review of the university's Stewardship Certificate Program and how it compares to similar efforts in Oregon and regionally, see appendix G.

[2] http://oregonorganichazelnuts.org/
[3] https://plantbreeding.oregonstate.edu/plantbreeding/research/hazelnut-breeding-program
[4] https://cdn.ymaws.com/members.oregonhazelnuts.org/resource/resmgr/2019/winter_meeting_ppt/stewardship_program_with_nik.pdf

FINDINGS

This section details findings from assessment interviews. Note that findings do not reflect a point of view of Oregon Solutions or any of our team members. Instead, findings reflect what we heard from interviewees. We asked interviewees their perspectives on a variety of substantive issues, including whether they see opportunities to build on an Oregon-Solutions-like collaborative effort. Interviewees were also asked to identify and consider how to overcome perceived challenges to collaboration.

An adaptive framework for research and experimentation in orchard management is underway with cross-sector participation

We found the hazelnut sector has networks that optimize production and watershed health as part of a research agenda shared with Oregon State University, and an adaptive management framework shared across grower, industry, and research public policy networks to mitigate risks. Through these shared networks, growers are learning how to mitigate threats to production. Overall, interviewees told us there is stable growth in hazelnut production, and they are confident in the tools and partners available to them to reduce risks from pesticides, water quantity and quality changes, and soil conditions. They noted the Willamette Valley provides optimal conditions for hazelnut orchards, which is why 99 percent of the nation's crop is grown in Oregon. There are natural and anthropogenic factors that create adverse conditions and pressures that increase risks of crop loss. Growers are well-organized, and have been working to improve production conditions and outcomes to reduce these risks through a variety of processes from their local networks (grower-grower, farm stores, and supplies) to membership-based organizations (Oregon Hazelnut Industry Office, Nut Growers Society, Hazelnut Commission, Hazelnut Growers of Oregon) to private service providers (crop advisors, nurseries, suppliers), and regional partners (National Resource Conservation Service, Soil and Water Conservation Districts, and Oregon State University). These mature networks help growers learn and adapt through field experimentation and scientific trials on the efficacy of products, emerging technologies, techniques, and best practices available to moderate risks.

Water quality was not seen as a lead issue at this time

Most interviewees did not see an urgent need to pursue additional regulations and processes specifically related to water quality. Water quality monitoring was a sensitive topic that raised flags. Many were suspicious of the intentions and value of a new forum to bring up water quality issues, especially any forum that singles out hazelnut orchards as a source of adverse impacts. Many interviewees said growers consider themselves stewards of the land who carefully manage critical Willamette Valley resources like water. The majority of interviewees also noted that the hazelnut industry is in compliance with federal and state environmental regulations and water quality standards. They shared that regulators and industry representatives alike did not foresee any current or projected regulatory drivers in the near-term (next five-years) that would create urgency for a new stakeholder process around water quality monitoring.

Orchard management practices for improving soil health have broad buy-in and early adopter incentives

On the other hand, we heard a strong interest from the majority of interviewees around soil health including mitigating soil erosion and maintaining associated land use protections. Development pressures are mounting from suburban areas with associated commercial and residential activities leading to conflicts in land use with farm operations. One indicator of this change is growing reliance on drift insurance which covers loss of crops or other damage from herbicide or pesticide sprays that cross property lines. Several lawsuits have raised the need for this coverage as incompatible uses (either farm to farm or farm to residential) have spillover effects. Further, productive farmland is finite and the best acreage for orchards has mostly been planted. Remaining acreage has less desirable soils and topography that require restorative practices to maintain soil fertility.

Farmers increasingly depend on mechanization for harvesting. Using this type of equipment favors bare orchard floors that allow limited space for buffer rows of cover crops and other vegetative practices that reduce erosion and runoff. Assessment interviews suggested that improving soil health conditions is an area for shared investment and research to determine best practice for conservation-cover configurations that work within different age structures of orchards.

Conservation cover is still in the experimental stage

Several interviewees expressed confidence that multiple benefits would result from orchard floor vegetation that would offset the soil impacts of bare rows for clearing and harvesting nuts. Yet, questions remain about how the type of plant material, orchard age, and timing of planting impact conservation coverage approaches. Questions also remain about the secondary impacts of conservation cover across the landscape. Interviewees reflected that technical assistance has shown promising results in orchard floor vegetation. However, early research is indicating that cover may also create habitat conditions for pests which could be seen more as a risk than a reward. Technical assistance programs also preclude cover crops yielding any saleable plant materials. Another stumbling block is the cost of equipment needed to manage cover crops. Such machinery is difficult to purchase, and opportunities for renting from service providers are limited as equipment can be in high demand or in poor shape from heavy use. As testing continues across age classes of orchards and various basin conditions, there is a benefit in sharing learnings across growers to keep the debate open about which cover crop configurations can best support production and environmental conditions conducive to plants, soils, and water.

Processors are well-established and play a critical role in setting quality standards and opening new markets for trade and commerce

We heard that processors play a critical role setting market standards in the selection of hazelnuts and establishing how growers use their purchasing power and distribution networks. Interviewees said that processing capacity has grown in lockstep with increased orchard production. The infrastructure capacity for processing hazelnuts is significant with close to 50,000 tons processed per year. Importantly, federal and state agencies and public

and private institutions work with processors to leverage compliance standards and build understanding around harvest conditions, such as allowable debris on nuts and negotiations for bulk purchasing and value-added options.

The market for organic hazelnuts (and certifications that show nuts are sustainably grown) is shifting grower practices and market pricing

We found the market for organic hazelnut is strong and is naturally creating incentives for some growers to integrate restorative practices into their tools for managing orchard conditions. Even though this is a small percentage of the total Oregon market, the Organic Hazelnut Cooperative in Oregon is out in front experimenting with different practices. The cooperative was established to open up processing and marketing opportunities for hazelnuts grown in orchards that support US Department of Agriculture and other organic certification programs**.** We heard that cooperative growers are leading experimentation efforts around how to incorporate orchard management, pest control, and harvesting methods that work with the natural life cycle of plants, insects, and wildlife. The cooperative is looking for leverage to negotiate bulk use of processing equipment to ensure quality standards for nuts produced using organic practices.

There are also a number of farm certification programs that promote the transition to more regenerative practices—see appendix X for relevant examples cited by interviewees. Particularly, the Stewardship Certificate Program, piloted with Oregon State University researchers, is targeted to hazelnut orchards and is working with participating growers to collect and share data to learn how orchards can best be managed for long-term sustainability. Interviewees reported that this certificate, piloted in 2019, was designed to create a competitive advantage by differentiating Oregon-grown hazelnuts from competitors in other markets. It highlights growers' compliance with applicable laws and best practices in production and processing, and their high standards for land, water, and labor practices.

There are opportunities to expand and invest in partnerships that diversify industry networks

The hazelnut industry is experiencing stable growth with broad-reaching benefits to the region and state. However, during interviews, we heard from several stakeholders that there are untapped opportunities to expand orchard management, ownership and markets to communities of color, indigenous people and generally to a younger demographic. Exploring workforce and education connections to hazelnut industry networks is one method to support the pipeline of talent and recruitment. Creating access to capital, diversifying orchard ownership, and expanding the distribution networks of hazelnut products could all accelerate participation in the industry's success.

RECOMMENDATIONS

An Oregon-Solutions-like project is not recommended at this time

We found that interviewees did not reflect a shared **sense of urgency or need for a new, broad scale collaborative effort focused on water quality** that would warrant the need for an Oregon Solutions-like collaborative process at this time. Interviewees said existing programs and forums are sufficient to support expansion of successful pilots to align hazelnut orchard management practices in the Willamette Basin towards best practices and shared long-term stewardship goals.

There are opportunities for a facilitated process

However, we did find that there are areas of alignment to pursue smaller-scale collaboration, share incentives, connect to community-based partnerships, and enhance formal and informal industry networks where best practices are shared. Over time these would support the assessment sponsor's goal of improved water quality in the Willamette Basin. Specifically, we find **there is an opportunity for facilitation within cross-sector networks of those interested in agriculture, water quality, crop resilience, and production.** That facilitation would assist in helping assessment sponsors achieve progress on improved water quality. This would enable sponsors to work with partners to monitor research and share lessons learned from ongoing research and testing that could strengthen the foundation for future grant applications regionally. From our interviews, we learned that the following topics could benefit from a cross-sector facilitated effort to ensure success is shared, scaled up, and replicated in a coordinated effort:

Topic 1: Explore ideas to expand incentive programs that accelerate early adoption of orchard management best practices aligned with watershed health and soil restoration

The Natural Resources Conservation Services and soil and water conservation districts have been working for decades to tailor incentives, training, and education programs to support local capacity for orchard management at all stages of production. Interviewees were clear that expansion of incentives and resources available to better respond to industry needs is always welcome and appreciated as an ongoing function of locally-based partnerships with federal and state programs.

Supporting processes and practices underway

- The hazelnut industry continues to seek federal and state resources and continues to participate in local work groups through the Environmental Quality Incentives Program to support cover crop and erosion control measures and rent equipment from soil and water conservation districts with the latest deadline in mid-April 2020.
- Equipment is needed to improve the efficiency and output of grower operations. Soil and water conservation districts support grower equipment rental and can add equipment by offering low-cost loans or purchasing programs from federal and state programs to spur best practices and better use of technology for precision farming.

- Rolling up best practices into a Regional Conservation Partnership Program application is feasible, but will likely require another year or two of experimentation with Environmental Quality Incentives Program funding applications. Experimentation will determine the highest return on investment and highest efficacy by soliciting information about growers' experience with different configurations and plant materials. There are still barriers to full buy-in around the use of cover crops as their maintenance can be resource intensive, not all growers have the appropriate equipment, and the cover crops may help harbor filbert worms which growers are working to eradicate.
- Natural Resources Conservation Services has developed a conservation implementation strategy for the Willamette Basin targeting erosion control in orchards. The strategy addresses primary resource issues to prevent soil erosion in orchards as well as vegetative practices that can reduce erosion and improve soil quality. The strategy seeks to build on those efforts and help more hazelnut growers use cover crops, conservation cover, mulching, and associated practices for erosion prevention in their orchards in Yamhill, Polk, Marion, and Washington counties.
- Irrigation systems are often dated and growers are generally supportive of upgrades, which provide better control and resource efficiency. Equipment for spraying hazelnut trees uses a diffuse spray to reach the full canopy depending on the age and structure of the orchard. Hazelnut orchards use considerably less water than similar nut trees and generally thrive in the Willamette Valley due to the natural rain cycle. However, irrigation is still an issue that can be improved with investment targeting areas in need.
- The cost of applying soil amendments to neutralize pH can vary greatly from year to year. Growers are always looking for ways to decrease the costs of protecting soil health and the natural regenerative process. Considering incentive programs that can restore soil health would be welcome by many growers to offset these costs.

Topic 2: Explore ideas on integrated pest management strategies to reduce pesticide use to improve environmental conditions conducive to productive orchard management

Oregon State University has led several successful integrated pest management projects, including research that informed development of the "Integrated Pest Management Strategic Plan for Hazelnuts in Oregon and Washington"[5] to inform best practices for growers through their horticultural department. Their research has contributed successfully to orchard management for enhancing habitat for insects that are beneficial and mitigate conditions for insects that put crops at risk. Oregon State University's work has attracted leading entomologists in studies for eastern filbert moth and brown marmorated stink bug. These efforts are providing critical data to growers and their service providers.

[5] https://catalog.extension.oregonstate.edu/em9223

Supporting processes and practices underway

- Pest management can be mitigated through filbert moth trapping, monitoring, and mapping to better track and address moth flights and life cycle interventions basin-wide.
- Oregon State University entomologists have been participating in the McKenzie River Basin Grower Moth Monitoring Project and providing input to help guide collection and research strategies to scale up and capture benefits of different approaches from pheromone disruption to moth traps and chemical efficacy. Expanding moth monitoring basin-wide in concert with mapping moth flight patterns would help growers have targeted sprays based on flight patterns and microclimate conditions and better data collection, inputs, and management.
- Private industry actors, primarily crop advisors, collect data on moth migration on a farm-by-farm basis at a large scale (estimated over 30,000 acres) as a free service for right-sizing management prescriptions. There could be integration in the future across public and private sector moth monitoring to track trends by climatic, seasonal, and other conditions for targeted sprays by coordinating data across the private and public sector.
- Anecdotally, it appears that Asana XL and Chlorpyrifos (lorsban) are being phased out in order to protect beneficial insect species. The low cost of pyrethroids make them more cost-effective to use. As integrated pest management strategies, including pheromone disruption and trap tracking, show promise, crop advisors and growers alike seem amenable to switching timing, products, equipment use and technology to mitigate runoff impacts.
- Eugene Water and Electric Board, Oregon State University, and grower partners in the McKenzie Basin Project are working on an expansion of moth mating disruption, monitoring and mapping. A new pilot will be testing research on abandoned orchards to test pheromone traps and the use of pigs for cleaning up infested acorns from neighboring white oak woodlands (which are a primary habitat for filbert moths year-round). Trials will begin in the McKenzie River basin fall 2020 to test the following:

    - Continued moth flight monitoring in orchards with potential to add in monitoring data from abandoned orchards and oak forests
    - Addition of pheromone rings to abandoned orchards and oak forests to concentrate moths away from active orchards
    - Introduction of pigs in abandoned orchards and oak forests that had pheromones to remove infested nuts
    - Use of native cover crop rows to attract pollinators and predatory wasps, reduce erosion, and add soil moisture
    - Align with Oregon State University's Research, Data and Stewardship Program and Integrated Pest Management Strategy as a platform for ongoing monitoring, adaptive management, and research.

Topic 3: Explore ways to partner on data collection, research, and marketing and education strategies through Oregon State University's Stewardship Certificate Program

The Oregon State University Stewardship Certificate Program,[6] which has been co-developed with the hazelnut industry, uses best practices and lessons learned from the almond industry of California. The Oregon Hazelnut Commission, Oregon State University, and Oregon State University Extension partnered in 2019 to pilot a hazelnut stewardship and sustainability certification program that includes strong water quality guidelines that reduce pesticide use and increase buffers to filter runoff from orchards. Grower data will support shared understanding across orchards from a variety of age classes, varieties, and locations. In conjunction, there will be ongoing research to test and improve inputs, outputs, and outcomes for better production and resource-efficiency. Data can also better advance legislative agendas, advocacy to right-size policies to hazelnut industry needs, and educate the public about the benefits of hazelnuts grown in their state.

Supporting processes and practices underway

- Data and results being compiled for Oregon State University's Stewardship Certificate Program can support tracking and monitoring outcomes from pilot projects to inform marketing campaigns to showcase why Willamette basin hazelnuts stand out in domestic and international markets.
- 2019 was the pilot year in which data was pulled from around 8,000 acres. Once certification guidelines are further developed, a third-party entity would be responsible for verifying that growers are meeting these requirements.
- Migration to a new database platform is expected to further lower barriers for participation to improve grower knowledge around how their operations compare to others in the industry.

Topic 4: Identify more ways to build on the Willamette Future Project to expand the network of public and private stakeholder forums for grower engagement opportunities

Utilities and other partners participating in the Willamette Future Project should continue working with Oregon Department of Agriculture's commodity commissions, including the Oregon Hazelnut Commission to engage in agenda topics that meet multiple objectives for production and water source protection. Work sessions may be required for deeper engagements. Generally, hazelnut industry leaders have been proactive with their investments in research and strategies for planning resource management from integrated pest management to sensor technology and more efficient irrigation systems. Joining in the regular forums where growers share best practices on panels and field tours will meet industry stakeholders where they are and facilitate two-way learning and dialogue.

[6] https://cdn.ymaws.com/members.oregonhazelnuts.org/resource/resmgr/2019/stewardship_program_meeting_.pdf

Supporting processes and practices underway

- Water quality regulation is not an urgent regulatory driver and with limited capacity for enforcement, there are other urban and agriculture runoff issues that are currently a higher priority. Stewardship of water resources is a sensitive topic as many growers already go to great lengths to ensure best practices in source protection.
- Targeted education, outreach, and research to inform inputs and outputs, as well as information learned through Oregon's water visioning process and the Willamette Futures Project can align with technology integration to better measure and control runoff contaminants for soil and water health. Partners are leading pilot demonstrations through early-adopter hazelnut grower champions to inform best practices for more targeted pesticide and herbicide use.
- Water quantity improvements can be made through drip irrigation systems and engineering practices to redesign water flow and efficient use.

Topic 5: Develop process to work with community-based organizations to diversify economic opportunities for stakeholders that support commodity crops and conservation

The Willamette River Network[7] is in its first year of transitioning from visioning to action and outreach—building directly on expanding the networks and success of the Willamette River Initiative. As part of weaving together resources and capacity for watershed stewardship work, the Willamette River Network is particularly in tune with the need to increase access for engagement, education, and career pathways for communities of color and indigenous communities in the Willamette basin.

Supporting processes and practices underway

- Community-based organizations and business leaders expressed their desire to see inclusive growth in the hazelnut industry as part of a broader effort to look at access to opportunities in the agricultural industry in the Willamette Basin.
- Institutional alignment and environmental education will broaden stakeholder engagement and the opportunities for workforce training and employment in the hazelnut industry to diversify community beneficiaries.

Topic 6: Expand work with organic growers to support their experimentation and monitoring of best management practices to scale up regenerative practices that can integrate approaches to orchard management in a broader ecosystem context

The Oregon Organic Hazelnut Cooperative[8] is championing methods of orchard management as part of an integrated, restorative ecosystem approach that is scaling up. The cooperative members represent small- and large-scale farms in their production, processing, and marketing of hazelnuts to increase the communications and connection between producers, consumers, and buyers.

[7] https://www.willametterivernetwork.org
[8] http://oregonorganichazelnuts.org

Supporting processes and practices underway

- Members have been active in research projects to test methods for reducing impacts from all stages of production from planting to spraying to harvesting to processing to ensure an alternative to conventional orchard management. Research backed by field testing can mitigate risks to growers. By experimenting with better methods of orchard management through institutional and industry partners working together, a mix of positive outcomes can occur.
- Though the price point is promising, the lower yield for organic (up to 40 percent less than conventional) is a risky calculation for many growers. Sharing best practices across organic and conventional growers can aid in value chain negotiations from production to processing to help mitigate these costs. As more blended options for integrating orchard management arise, there will be opportunities to align marketing strategies accordingly for all Willamette basin growers.

APPENDIX A: ASSESSMENT INTERVIEWEES

- Tana Atchley Culbertson, Meyer Memorial Trust—Willamette River Network
- Les Bachelor, Natural Resources Conservation Services—Marion County
- Jody Christensen, Governor's Regional Solutions Office
- Evelyn Conrad, Natural Resources Conservation Services District Conservationist—Polk County
- Arlene Dietz, Rice Farms LLC
- Micah Elconin, President, Season to Taste, Inc., and Director, Eugene's Table
- Jason Faicunas, Scott Eden, and Matt Van Wey—Clackamas Soil and Water Conservation District
- Nancy Grahmlich, Department of Environmental Quality—Willamette Basin Coordinator
- Alex Grant, Hagan Hamilton Insurance Solutions
- Joey Jarczewski, Sohr Foods
- Taylor Larson, My Brothers Farm and Vice President of the Organic Hazelnut Cooperative
- Danny Malcolm, Malcolm Media Director of Sales
- Betsey Miller, Oregon State University Department of Horticulture
- Justin Overdevest, Good Company
- Polly Owen, Manager of Oregon Hazelnut Industry Office
- Adam Phipps, Field Technical Valley Agronomics
- Michael Powers, Oregon Department of Agriculture
- Kathryn Reinecke, Family Hazelnut Farmer and Organic Hazelnut Cooperative
- Marie Vicksta, Yamhill Soil and Water Conservation Districts
- Jed White, Cascade Foods
- Nik Wiman, Oregon State University Extension

APPENDIX B: ASSESSMENT INTERVIEW QUESTIONS

1. Are you familiar with the Oregon Solutions process, and/or have you been involved in a collaborative process before? If yes, please provide examples around the role you played, topic, outcome, etc.
2. What have you learned about hazelnut orchard impacts on water quality issues?
3. Are you familiar with either the McKenzie River Basin pilot project related to moth monitoring? What is your general reaction to this proposed project?
4. Do you know of earlier projects for stewardship certification and other drivers to improve agricultural runoff in the basin? If yes, were you involved?

   Who was not involved who should have been at the table for future processes?

   Share list of stakeholders being interviewed.
5. What do you think the *goals* should be for an Oregon Solutions team focused on hazelnuts and improved water quality in the Willamette River Basin?
6. What do you think this project needs in order to be successful? Who/what might be able to meet those needs?
7. What are the challenges or barriers to addressing this proposed project? Do you have suggestions for how they might be overcome?
8. Are there differences regarding technical data or policy that could pose an issue for this project?
9. Who do you think should sit at the table—public, private, civic stakeholders?
10. Would you/your organization be willing to participate in a collaborative project team on this project? Are there resources that you could bring to support such an effort?
11. Who lends the authority and ability to be a convener and engage diverse partners to accomplish this project?
12. What would success look like?
13. What would happen if an Oregon Solutions process were not convened?
14. Do you have any questions for us? Is there anything else you want to address that wasn't addressed already

APPENDIX C: SUPPLEMENTAL BACKGROUND—ORCHARD MANAGEMENT BY AGE CLASS

Generally, hazelnut trees are good for soil, wildlife, and are being advocated for in other states for their regenerative properties.[9] With roots going down 9.5 feet or more, hazelnut trees can serve as an effective mechanism for holding soil and capturing nitrogen in the

[9] https://www.arborday.org/programs/hazelnuts/consortium/agriculture.cfm

zone where it remains available for plants.[10] There is a learning network of growers connected through research, publications, and suppliers within and outside Oregon looking for better ways to grow hazelnuts that ensure long-term health of the industry. Some barriers exist around mitigating impacts of bare orchard floors. There is not a perfect formula yet for integrating cover crops, conservation cover, or mulching. The hazelnut industry is increasingly interested in experimenting with these methods for erosion control to boost long-term stability and better conditions for harvest. Growers have established some early successes in addressing erosion and drainage issues with support from partners including Natural Resources Conservation Services, soil and water conservation districts, and Oregon State University to right-size solutions to the age, structure, and seasonality of orchard management:

- Age Class 1 (1–5 years) orchards are ripe for cover crop plantings to mitigate soil erosion, limit water runoff, and retain nutrients year-round in preparation for the first harvest.
- Age Class 2 (6–10 years) describes when orchards are steadily harvestable (after 5 years), growers can utilize cover crop plantings for the shoulder season and intentionally manage grasses and other organic material within the orchard floors to maintain worms and natural predators such as wasps which feed on filbert moths to naturally improve pest management.
- Age Class 3 (11+ years) includes mature orchards with denser canopy structures that inhibit weed growth and limit the reach of equipment to manage cover crops. At this stage, pruning can play a major role in opening canopy cover. Tracking pests that threaten nuts such as filbert moths and worms for integrated pest management is also important.

[10] https://www.messagemedia.co/aitkin/news/agriculture/extension-clc-hazelnut-workshop-well-attended/article_a8ee6542-5f1b-11ea-8756-e340a6338180.html

APPENDIX D: KEY MEETINGS, PRESENTATIONS, AND EVENTS

The following meetings and events provided content and context for the assessment. Description and dates of the event are followed by key informants who either presented or provided direct input as part of information gathering for the assessment.

January 16, 2020, Nut Grower Society; presentations, informal interviews, and trade show, including inputs from the following:

- Jenny Dresler, lobbyist (presentation of legislative priorities to fight regulatory restrictions on fuels and fertilizers)
- Larry George, CEO of the George Packing Co., former state legislator (discussion on trade tariffs and grey markets in Asia)
- Oregon Hazelnut Commissioner Matt Schuster (presentation on why data from the stewardship certificate is important for elected officials)
- Insurance agencies around drift liability (informal booth discussions)
- Storage engineers around products for drying (informal booth discussions)
- Vendors for value-add products, nurseries, processors (informal booth discussions)
- Farmer data tools and technology integration into decision making and mechanization (informal booth discussions)

February 9, 2020, Elevating Impact Summit

- Speaker Reyna Lopez, Pineros y Campesinos Unidos del Noroeste, more commonly known by the acronym PCUN, represents farmworker organizations in the Willamette Valley (presentation on how their organization has grown to leverage cultural assets into process design and action)

February 13, 2020, Pollinators in the Pacific Northwest American Planning Association-Oregon Chapter (OAPA) Webinar

- Focus on how widespread pollinator die-offs from mismanaged pesticide applications led to community-based programs and state legislation in Oregon to protect pollinators. Various certification programs through Pollinator Partnership and the Bee Better Farms Certification (online presentation and follow up with Oregon State University faculty)

February 24, 2020 McKenzie Growers Meeting

- Discussion of moth monitoring outcomes for 2019 (targeted sprays and no moth issues in production) and how to improve the program for next year. Attendees included growers and farmers, soil and water conservation districts, Natural Resources Conservation Services, Eugene Water and Electric Board and Oregon State University representation. (in-person discussion)

March 4, 2020, Oregon Utilities Drinking Water Source Protection

- Discussion around the Willamette Futures Project and how hazelnuts rose to the top as the crop to start with around best management practices for soil and water health to improve water quality and quantity outcomes. (in-person discussion)

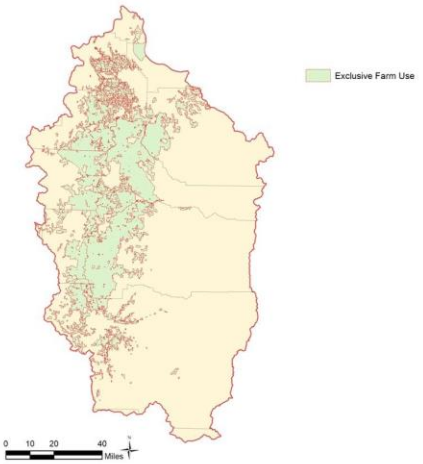
March 4, 2020, Hazelnut Grower Member Annual Meeting

- Informal interviews with crop advisors around pest management services and database management and options (in-person discussion followed up by email summary)

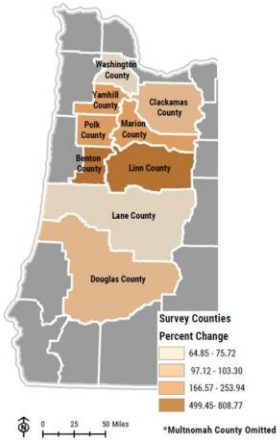
APPENDIX E: HAZELNUT PRODUCTION ACREAGE AND SERVICE PROVIDERS IN OREGON

Willamette Basin

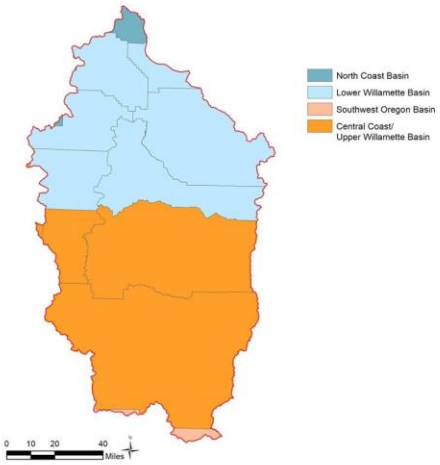
Exclusive Farm Use 2017



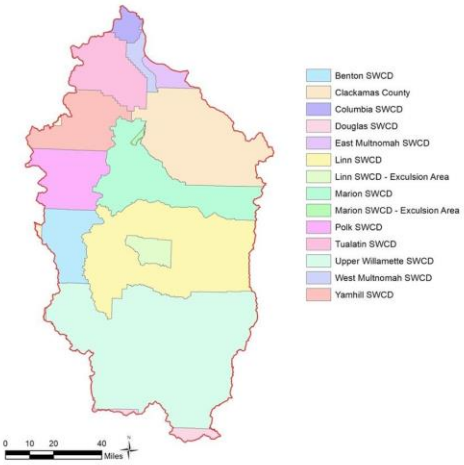
Percent change
in Hazelnut Acreage 2008 - 2018



NRCS Districts by Basin



Soil and Water Conservation
District Boundaries 2015



Data sources: Oregon Hazelnut Stewardship Program and Oregon Spatial Data Library

APPENDIX F: WILLAMETTE FUTURE PROJECT BACKGROUND SUMMARY

With an increase of pressures on natural resources in the Willamette Basin, including drinking water for a growing number of municipalities, the Willamette Future Project reviewed and prioritized strategies to guide water utility investment in source protection. Promotion of smart, sustainable agricultural practices to limit the amount of pesticides and toxins in the Willamette and tributaries was a defining strategy. As one of the fastest advancing crops, hazelnut growers can lead on watershed management one orchard at a time while establishing a framework in which utilities can work with other agricultural commodities (e.g., blueberries, nursery stock, Christmas trees, etc.) in the future. The next steps to reduce pesticide use and minimize erosion in orchards were proposed as follows:

- Assist the hazelnut industry with establishing basin-wide monitoring for moth emergence and flight to allow targeted pesticide applications and provide data on moth trends over time. This will inform how climate change and increasing acreage of hazelnut orchards in the basin impact moth life cycle and abundance.
- Establish a regularly scheduled (e.g., once every three years) well-coordinated and funded basin-wide chemical collection event that allows growers to get rid of legacy pesticides and other farm chemicals no longer needed for safe and effective disposal or destruction and removes chemicals from the floodplain.
- Develop funding sources. One potential near term funding source is the Farm Bill.
- Develop funding for source water protection efforts with agriculture on the main tributaries in the Willamette basin. The Oregon Natural Resources Conservation Services sees the National Water Quality Initiative, which focuses on source protection, as designed for tributary watersheds like the McKenzie, Santiam, Clackamas, Tualatin, etc., that provide drinking water to downstream populations.
- Pursue development of a Natural Resources Conservation Services Regional Conservation Partnership Program proposal, which can be a platform for combined investment from water utilities, Oregon Hazelnut Commission, Natural Resources Conservation Services, the Environmental Protection Agency, the Department of Environmental Quality, and other funding partners for chemical reduction projects, erosion controls, riparian buffers, and grower certification for the hazelnut industry that can be replicated in other agricultural sectors.
- Host initial conversations between water utilities, Natural Resources Conservation Services, soil and water conservation districts, Oregon Department of Agriculture, the Department of Environmental Quality, watershed councils, and hazelnut industry (started in summer 2019) to develop a path forward and proposal to Natural Resources Conservation Services for establishing a basin-wide Regional Conservation Partnership Program funding stream.

- Use this collaborative approach between growers and downstream water utilities to tell the story that increases the domestic market for Oregon hazelnuts, increasing the financial health of the industry.

APPENDIX G: COMPARISON OF GROWER CERTIFICATION PROGRAMS

Salmon-Safe
Reference https://salmonsafe.org/

Purpose
Salmon-Safe is one of the ecolabels based on farm and urban lands certified in Oregon, Washington, California, and British Columbia. Their movement, through certification and accreditation programs, is to implement farming practices and developments that protect water quality, maintain watershed health, and restore habitat. Their mission is to transform land management practices so Pacific salmon can thrive in West Coast watersheds.

Profile

- Since 1997, Salmon-Safe has collaborated with farmers in Oregon, Washington, and California, and in 2005, standardized fish-friendly farm guidelines under the Salmon-Safe Farm Management Certification Program. Salmon-Safe has provided diverse verification for environmental practices protecting water quality and habitat: urban development, vineyards, corporate and university campuses, infrastructure, parks and natural areas, golf courses, and farms.
- Producers who got Salmon-Safe certificates provide a vision for voluntary adoption of resilience-building practices that keep streams healthy enough for salmon. Farmers have trouble due to limited time and resources availability. Salmon-Safe rewards growers and ranchers, wherever they protect streams and other natural resources, with tangible actions that provide the most benefit for fish and wildlife at the lowest cost to the landowner.
- Salmon-Safe joined forces with Seattle-based stewardship partners in 2004 to introduce Salmon-Safe across Puget Sound's agricultural tributaries. For urban work around Puget Sound, Salmon-Safe leads outreach through their Seattle-based operation. Now, they are entering a new phase in scaling up their Puget Sound presence as they seek to accelerate the development market's shift to practices that protect Puget Sound water quality and migrating salmon.
- Certification standards are organized into seven categories, and F.4 and F.5 focus on water and soil health. The core certification standards consist of standards and performance requirements.

    F.4. Erosion Prevention and Sediment Control

    F.5. Integrated Pest Management and Water Quality Protection

    - Sediment delivery causes habitat degradation, particularly for salmonid spawning areas, so this standard evaluates potential upland sources of erosion: farm roads, agricultural fields and pastures.

- To minimize soil erosion losses, the use of cover crops or pasture grasses are required, and deep-rooting native plants are recommended to control erosion and improve soil stability.
- Salmon survival is influenced by the water quality free from fertilizers (nutrients), pesticides (herbicides and insecticides, fungicides and other biocides), petroleum (e.g., gasoline, diesel, oils, hydraulic fluid) and organic waste. The standards focus on action to:
  - Minimize overall inputs of these contaminants;
  - Restrict the type of chemicals that could potentially enter streams;
  - Develop an acceptable method of application through a comprehensive management strategy such as an integrated pest management strategy; and
  - Construct proper facilities for their use, handling and storage.

California Almond Sustainability Program (CASP)
Reference http://www.almonds.com/growers/sustainability

Purpose

- The CASP community makes efforts to adopt cost-effective, environmentally and socially responsible practices, and this program achieves this through growers' and handler's self-assessment with aggregated results for communications, education, and continuous improvement. They defined sustainability specific to almonds, and it reads: "Sustainable almond farming utilizes production practices that are economically viable and are based upon scientific research, common sense and a respect for the environment, neighbors, and employees."

Profile

- The CASP was established in 2009 in part to better understand the ongoing sustainability improvements of farmers across all production practices and to provide continuing education on these topics. This program provides interactive tools to streamline both crop input decision-making and regulatory reporting requirements and self-assessment modules that cover the spectrum of almond growing practices. In addition, funding is available for the California Department of Food and Agriculture's Healthy Soils Program (HSP) for soil health and responsible ecosystem practices. HSP requires growers to intentionally plant cover crops, mulch, implement whole orchard recycling, compost and plant hedgerows. There are two components of this program: the HSP Incentives Program and HSP Demonstration Projects.
- The CASP has been led by the Almond Board of California, and through grower-submitted production information, they demonstrate the sustainability of the industry to stakeholders "buyers, regulators, and consumers" and help growers find ways to improve efficiencies.

- To date, about 23 percent of California's almond acreage is represented by completed assessments. Over the past two decades, almond farmers have successfully reduced the required amount of water by 33 percent with improved production practices and adoption of efficient micro-irrigation technology. In addition, the CASP announced the almond orchard 2025 goals, focusing on zero waste, water efficiency, pest management, and air quality.
    - By 2025, the California almond community commits to reduce the amount of water used to grow a pound of almonds by an additional 20 percent.
    - By 2025, they commit to achieve zero waste in their orchards by putting everything they grow to optimal use.
    - By 2025, they commit to increase adoption of environmentally-friendly pest management tools by 25 percent.
    - By 2025, they commit to reduce dust during harvest by 50 percent.

Washington State University Orchard Floor Management
Reference http://treefruit.wsu.edu/orchard-management/orchard-floor-management/

Purpose
Orchard floor management is a part of the Organic Tree Fruit Program for consumer preferences and environmental imperatives. This management impacts the health of fruit trees as well as overall productivity and quality of fruit, so there are a number of interrelated purposes in the orchard: soil condition, nutrient availability, water management, weed control, insect habitat, and prevalence of rodents. All of these influence the growth, development and productivity of fruit trees.

Profile
- In 1969, the Washington State Legislature passed the Tree Fruit Research Act, and Washington State University (WSU) became the major partners to the Washington tree fruit industry. In 2011, the tree fruit industry and WSU jointly launched an effort to permanently expand research and WSU-Extension capacity at WSU. Orchard floor management covers a number of aspects, including weed control, soil health, ground cover selection and management, management of pruning, mulching, water management, rodent control, and soil amendments and nutrient additions.
- These days, farmers and consumers are focusing on the benefits of sustainable food production, and sustainable practices, good for the soil and the environments, will benefit producers and the consumer public. Certified organic growers must prove their practices, which are maintaining or improving soil quality, as part of the certification process.
- Apple replant disease is a major concern for growers, and a plant pathologist at the USDA-ARS Tree Fruit Research Lab has identified an alternative treatment to fumigation. He has found that a combination of yellow and white mustard seed meal mixed into the soil as a pre-plant treatment controls these organisms.

Bee Better Certified (BBC)
Reference https://beebettercertified.org/

Purpose
Bee Better Certified makes efforts to provide bees a healthy place to live, and they try to conserve bees and other pollinators in agricultural lands, working with farmers and food companies. Their work has developed more resilient pollinator populations and sustainable crop production. The BBC seal proves and celebrates the partners that adopt farm management practices, and gives consumers confidence that their purchases benefit pollinators and the farmers working to protect them.

Profile
- BCC is the only third-party food and farming certification program in the world focused specifically on pollinator conservation. With the goal of giving bees a healthy place to live, the program was launched in June 2017 by the Xerces Society for Invertebrate Conservation in collaboration with national nonprofit organic certifier, Oregon Tilth.
- They work with conservation-minded farmers and innovative food companies who are committed to enacting their science-based standards. Bee Better certified farms are flower-rich environments that contain nesting habitat protected from pesticides.
- Xerces Society has developed a standard for protection from pesticides, abundance of flowering areas throughout the growing season, a place for the bees to call home, and an ecosystem where the spread of disease is limited due to more native bees versus commercial bees. The BBC seal indicates that certified ingredients were grown in ways that support bees, butterflies, and other beneficial insects.

Oregon State University Hazelnut Stewardship Program
Reference https://cdn.ymaws.com/members.oregonhazelnuts.org/resource/resmgr/2019/winter_meeting_ppt/stewardship_program_with_nik.pdf

Profile
The stewardship program is the collection of self-reported data on hazelnut production practices, and through the data collection, they try to be prepared to respond to misinformation around orchard production and how growers are responding to regulatory issues. In 2019, Oregon State University Extension and Oregon Nut Growers Society of Oregon, Washington, and British Columbia established hazelnut stewardship programs for sustainable hazelnut industry, and encouraged growers to participate in a pilot project in 2019.