

MANY SMALL HAMMERS

Practices and Resources for Northwest Growers



NORTHWEST CENTER FOR
ALTERNATIVES TO PESTICIDES

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WHY USE ALTERNATIVES TO PESTICIDES?

Have you considered reducing your reliance on pesticides? If so, you're in good company. Many growers are interested in increasing their use of sustainable pest management strategies and specifically in implementing alternatives to synthetic insecticides, herbicides and fungicides. Some growers may wish to satisfy the requirements of a specialized organic market – or worry about meeting stricter pesticide Maximum Residue Levels (MRL) on foods slated for export markets. Others may be motivated by a desire to protect water sources or a need to meet legal waterway buffer restrictions, such as those required to protect salmon (<https://www.epa.gov/endangered-species/salmon-mapper>) from certain

pesticides. All growers care about resistance – a problem that occurs when a pesticide that once controlled a pest is no longer working. In Oregon, 18 weed species are currently resistant to one or more herbicides, while 12 weed species are currently resistant in Washington (International Survey of Herbicide Resistant Weeds, <http://www.weedscience.org>).

To be profitable while reducing synthetic pesticides, sustainable agriculture requires a comprehensive awareness of alternative farming methods. The concept of using “many small hammers” to effectively address pest management problems – rather than the “big hammer” of a pesticide – is an approach grounded in a view of the farm as a living, diverse and dynamic system. In recent years, many extension services and groups supporting sustainable agriculture have used this metaphor to describe a more holistic approach to pest management.

This report provides an overview of several of these “small hammers” for growers who wish to consider implementing alternative methods for pest management. Some of the methods may be useful on a portion of the farm, for instance where growers are challenged to adhere to no-spray buffers for endangered species or aquatic protection reasons. Others may be useful across the board as general practices to put in place in order to minimize the reliance on synthetic pesticides.

In addition to alternative methods, this report provides a brief overview of different federal financial incentive programs available to help pay for the cost of farming with alternative methods.



Roller Crimper

WHAT IS INTEGRATED PEST MANAGEMENT?



According to the Food and Agriculture Organization (FAO), Integrated Pest Management (IPM) is an ecosystem approach to crop production and protection that combines different management strategies and practices to grow healthy crops and minimize the use of pesticides. Key IPM principles include establishing thresholds for taking action, monitoring the pest infestation level and trying a variety of non-chemical approaches before using chemicals. IPM seeks to reduce pest numbers below economically damaging levels rather than eradicating pests completely. Many pests cause only minimal yield losses and can be tolerated. Pesticides should be applied only when economically justified by the number of pests present, and least-toxic pesticides should be chosen when available.

IDENTIFYING THE PROBLEM

Before reaching for that synthetic weed-killer or insecticide, consider your options and the benefits of choosing more sustainable approaches. First, make sure to properly identify the problem.

Resources for identifying weeds, insects and diseases include:

Photo Gallery of Pacific Northwest Weeds

<http://uspest.org/pnw/weedimages?weeds/id/index.html>

Weed Science of America Identification Guide

<http://wssa.net/wssa/weed/weed-identification/>

Oregon State University Dept. of Horticulture Weed Identification Module

<http://horticulture.oregonstate.edu/content/welcome-pnw-weed-identification-module>

Oregon State University Insect ID Clinic

http://www.science.oregonstate.edu/bpp/insect_clinic/index.htm

A Comprehensive Listing of Pests for Agricultural Crops

<http://www.ipm.ucdavis.edu/PMG/crops-agriculture.html>

BugGuide.net

<http://bugguide.net/node/view/6/bgimage>

American Phytopathological Society Disease Lessons

<https://www.apsnet.org/edcenter/intropp/lessons/Pages/default.aspx>

Pests: WSU Pest Leaflet Series

<http://puyallup.wsu.edu/plantclinic/pls/>

Oregon State University Extension Services

<http://extension.oregonstate.edu/find-us>

Washington State University Extension Services

<http://extension.wsu.edu/locations/>

University of Idaho Extension Services

<http://www.extension.uidaho.edu/find.aspx>

Pacific Northwest Pest Management Handbooks

<https://pnwhandbooks.org/>

In addition to correctly identifying your pest, you'll need to assess the level of pest pressure and continue monitoring after any action you take to determine the efficacy of your action.

SO I'VE GOT A PROBLEM— WHAT DO I DO NOW?

Usually, chemical-free options are available. Key categories of alternative practices include biological controls, cultural controls and mechanical controls. Examples of each are discussed in the following section.

INSECT MANAGEMENT - ALTERNATIVE APPROACHES

BIOLOGICAL CONTROLS FOR INSECT MANAGEMENT

Natural enemies: Natural enemies include predators, parasitoids, or pathogens that are known to prey upon or weaken pest species. Maintaining on-farm habitat that supports natural enemies helps with pest management. Such methods, known as farmscaping (also known as insectary habitat, beetle banks or conservation biological control), can also encourage pollinators. Supplemental release of natural enemies (classical or augmentative biocontrol) obtained from commercial suppliers is also an option. These can be released into fields at a critical time of the season to supplement natural populations already present. Two examples include:

- *Trichogramma* is a commercially available, parasitic wasp that destroys the eggs of commercially important pests, including peach borer, cankerworm, alfalfa caterpillar, cutworm, corn earworm, tomato hornworm, cabbage looper, and codling moth. These natural enemies are often released in vegetable or field crops at a rate of 5,000 to 200,000 per acre, per week, depending on the level of pest infestation.
- *Insect-parasitic nematodes* (also known as entomopathogenic nematodes) are often applied at a rate of one million to one billion nematodes per acre.

Pathogens: Insects can also be weakened or sickened by pathogens such as viruses, fungi or bacteria. Such biological control agents have been successfully deployed against a variety of pests. For example, the naturally occurring bacterium *Bacillus thuringiensis* is used in a variety of pest control applications. *Bacillus thuringiensis* var. *israeliensis* is used to control mosquitoes and *Bacillus thuringiensis* var. *tenebrionis* is used to

treat some pest beetles. *Bacillus thuringiensis* var. *kurstaki* (Btk for short) is used to control caterpillar pests such as gypsy moths.

Mating disruption: This technique, which relies on interference with insect hormonal pheromone signals or release of sterile insects, has resulted in key successes in several commercial crops, including codling moth in pome fruit, oriental fruit moth in peaches and nectarines, tomato pinworm in vegetables, pink bollworm in cotton, and omnivorous leaf roller in vineyards. As of 2014, mating disruption products have been developed for approximately 20 pest species, and the EPA has registered more than 120 disruption products (Gut and Miller 2014). Some efforts have yielded significant reductions in pesticide use over wide areas while maintaining acceptably low crop damage levels. This method is more effective over large, continuous areas.

Useful resources for natural enemy identification and enhancement:

A Pocket Guide to Common Natural Enemies of Crop and Garden Pests in the Pacific Northwest

http://ipmnet.org/Pocket_Guide_of_Natural_Enemies.pdf

Natural Enemies Gallery

<http://ipm.ucanr.edu/PMG/NE/index.html>

Practical guidelines for establishing, maintaining and assessing the usefulness of insectary plantings on your farm

http://smallfarms.oregonstate.edu/sites/default/files/farm_insectary_plant_manual_draft2_pressquall_0.pdf

The Xerces Society Publication: Farming with Native Beneficial Insects (Mader et al. 2014)



Pollinator and beneficial insect hedge row

CULTURAL AND MECHANICAL APPROACHES FOR INSECT MANAGEMENT

Host plant removal: This involves knowing the alternate host plants used by insect pests and removing them.

Sanitation: Cleaning up fallen fruit and plant residues is known as sanitation. It can be an important aid to pest management, for instance, when pests pupate in fallen fruit.

Mass trapping: Chemical lures (such as pheromones) can be used to attract insects to field traps. Mass trapping using odor-baited traps is one of the older approaches to direct

control of insects and has resulted in success for insects in the orders Lepidoptera (butterflies and moths), Coleoptera (beetles) and Diptera (true flies). This technique is designed to suppress populations prior to reproduction or damage to crops. Mass trapping is considered most effective with low-density pest infestations (El-Sayed et al. 2006).

Exclusion: vNetting is a form of exclusion that can be effective in some situations. It prevents pests from landing on and burrowing into the crop.

NCAP'S WORK TO SUPPORT MANAGEMENT ALTERNATIVES: CASE STUDY – SPOTTED WING DROSOPHILA

Spotted Wing Drosophila, a small fly often referred to as SWD, arrived in North America in 2008. This challenging pest causes significant damage to small fruits, leading many growers to implement a scheduled, weekly application of pesticides, some highly toxic, to manage it.

In 2015 and 2016, NCAP collaborated with Oregon State University and Washington State University to educate growers on several non-chemical approaches that can reduce population buildup. These methods include:

- *Sanitation:* Harvesting fruit promptly to reduce the chance for egg-laying is critical. In addition, removing infested fruit is a key step for interrupting the life cycle.
- *Solarization:* The use of plastic solarization to heat soil to 130°F or above shows promising results when placed over SWD-infested blueberries resting on the ground.
- *Manage humidity:* Pruning can open the canopy and decrease the humidity, thus reducing SWD incidence. Avoiding overhead irrigation can do the same.
- *Manage the landscape:* Non-berry crops may provide food, refuge or alternate egg-laying sites. Consider removing these from the landscape or employing mass trapping on the landscape periphery.
- *Exclusion:* Netting plants can prevent SWD from laying eggs in fruit.
- *Natural enemies:* Current research shows that native, natural enemies in the Pacific Northwest have minimal impact on the SWD population in terms of suppressing the pest below economically damaging thresholds. Natural enemy approaches are being researched.
- *Organically approved insecticides:* Insecticides that are approved under organic rules, including Spinosad, has shown good efficacy against SWD.

For more information, visit:

www.uspest.org/swd and www.spottedwing.org



Spotted Wing Drosophila | Photo: Dr. Amy Dreves



Harvest fruit promptly | Photo: Our Enchanted Garden

WEED MANAGEMENT - ALTERNATIVE APPROACHES

Reducing weed pressure without resorting to chemical approaches requires diligent adherence to a set of tightly integrated approaches and practices. Key principles by Schonbeck (2013) include:

1. Know the weeds.
2. Design the cropping system to minimize niches for weed growth.
3. Keep the weeds guessing with crop rotations.
4. Design the cropping system and select tools for effective weed control.
5. Grow vigorous, weed-competitive crops.
6. Put the weeds out of work – grow cover crops!
7. Manage the weed seed bank – minimize “deposits” and maximize “withdrawals”
8. Knock out weeds at critical times.
9. Utilize biological control processes to further reduce weed pressure.
10. Bring existing weeds under control before planting weed-sensitive crops.
11. Keep observing the weeds and adapt practices accordingly.
12. Experiment.

SELECTED CULTURAL AND MECHANICAL TECHNIQUES FOR WEED MANAGEMENT

Helpful cultural options include crop rotation, soil solarization and bed preparation, to name just a few. Strategic crop rotations can reduce weed pressure. For instance, plant a crop that is vigorous and has heavy biomass before a slow-growing crop that would normally have trouble competing with weeds. Good rotations alternate crops, varying factors like: root depth and biomass, nitrogen fixing capacity, leaf density, alternate hosts, or time of sowing and development (Mohler 2009).

According to Schonbeck (2011), a well-managed cover crop can give nearly 100% weed control while it is growing and substantial weed management benefits in subsequent

vegetables. However, a cover crop poorly managed can become a weedy mess and make a huge deposit into the weed seed bank. Schonbeck emphasizes the following cover crop principle:

- Choose the right cover crop for the climate and the season.
- Be sure to use high quality seed.
- Prepare a good, weed-free seedbed.
- Take care of the cover crop; don't hesitate to water, feed or lime if warranted.
- Grow a cover crop to maturity if, and only if, it is a good stand.

In addition to cultural techniques, mechanical management options can also be used. Mechanical weed management can be very helpful when used correctly but can exacerbate the problem if poorly managed. For example, perennial weeds with rhizomatous or extensive root systems (quackgrass and Canada thistle are two examples) need to be managed with care. If the infestation is not severe, regular hoeing and disking can weaken the plant and eventually eliminate the weed. However, hoeing or disking may worsen the problem because when a rhizome is fragmented in the soil, the smaller pieces can grow into a new plant. For this reason, monitoring and planning are recommended as the first steps in weed management. Monitoring, used early and often, can help identify weedy areas before the problem becomes so severe that a given management practice will no longer work. Additionally, planning helps to ensure that management practices are undertaken with the proper understanding.

Cultural and mechanical methods work well with other approaches, the many small hammers way. In the previous example, mechanical management in combination with a cultural method – such as growing a vigorous cash or cover crop that effectively outcompetes the rhizomatous weed – may work better together.

Table 1 (pg. 8) compares a variety of weed management techniques.



Table I. Alternative Weed Management Techniques

Technique	Annual Row Crops	Perennial Crops	Orchards/ Berries	Pros	Cons
Crop Rotation	X	X		Interrupts weed, insect and disease cycles.	Requires knowledge and available markets for different crops. May require different machinery.
Cover Crops	X	X	X	Minimizes weed establishment during winter or between cash crop cycles. Depending on the species used, may inhibit or suppress insects or disease in subsequent crops. Cover crops benefit soil fertility, add organic matter and minimize soil erosion.	Seeding timing and rate is critical for successful germination and growth. If herbicides are not desired, mowing, tillage, roller-crimpers, livestock grazing or winterkill must be employed instead to terminate crop before seeding.
Mulches		X	X	Can increase soil water retention, reduce weed establishment and increase soil organic matter.	Cost to implement and maintain. Certain mulches may increase weed problems.
Living Mulches		X	X	Maintains plant cover between crop rows, can inhibit weed establishment.	Can compete with main crop if not managed correctly. May increase rodent pressure.
Tillage/ Cultivation	X	X	X	Variety of systems available.	Overuse of tillage can impact soil structure, increase germination of light-sensitive weeds and worsen rhizomatous weeds.
Rollers/ Roll-crimping	X			Used to mechanically kill or suppress cover crops. Residues persist on surface and can inhibit weed germination. Allows for no-till drilling or strip tillage for establishment.	Timing is important. Some residues may not adequately suppress weeds, may be difficult to plant into and can delay crop emergence.
Mowing	X	X	X	Reduces weed seed set. Can be useful for some perennials, pastures, and orchards. Can be used to terminate certain cover crops.	For use as a cover crop termination method, crop needs to be mature.
Flame-weeding	X	X	X	Minimizes impacts to soil structure. Good for broadleaf annual weeds.	Not as effective with grasses and perennial weeds; requires fossil fuels.
Livestock/ Poultry	X	X	X	Natural method to promote consumption of weeds.	Requires consideration of animal needs, such as water, shade and fencing. Also may complicate food safety issues.
Solarization (Clear Plastic)		X	X	Traps solar energy in the soil, heating the top 12 to 18 inches and killing a wide range of soilborne pests, such as weeds, pathogens, nematodes, and insects.	Labor and material intensive; not effective against all perennial weeds and certain insects and fungi.
Irrigation Management	X	X	X	Can reduce competitiveness of certain weeds; may result in reduced water consumption, saving water and money.	Capital costs to convert to drip or other conserving systems may be high.
Conservation Biological Control	X	X	X	Provides habitat for natural enemies for insect control. In addition, certain birds, insects and rodents can consume weeds and weed seeds.	Requires habitat to be installed and maintained.

NCAP'S WORK TO SUPPORT MANAGEMENT ALTERNATIVES: CASE STUDY – SOIL SOLARIZATION



Since 2013, NCAP has been working in partnership with local producers in Idaho to install and maintain beneficial insect and pollinator habitat. To eliminate and suppress weeds prior to planting, NCAP has used soil solarization. There are four basic steps to performing soil solarization for weed management:

1. Mow, rake or cultivate the site in the spring to prepare a seed bed for fall planting. There will be no opportunity to cultivate after the plastic has come off, because ground disturbance might bring up additional weed seeds.
2. After smoothing the site, wet the ground and lay UV stabilized plastic (such as 6 ml. high tunnel plastic), burying the edges to prevent airflow between the plastic and the ground.

Weigh down the center of the plastic if necessary to prevent the wind from lifting it. Use greenhouse repair tape for any rips that occur during the season.

3. Remove the plastic in early fall before the weather cools and the area beneath the plastic is recolonized by nearby rhizomatous weeds.
4. Immediately plant pollinator seed mix and/or install transplants.

For more information, review the NCAP publication, *Establishing Pollinator and Beneficial Insect Habitat on Organic Farms in Idaho* found at http://www.pesticide.org/pollinator_and_beneficial_insect_habitat

DISEASE MANAGEMENT - ALTERNATIVE APPROACHES

Plant disease can be caused by a wide range of pathogens, including viruses, bacteria, fungi, and nematodes. Diseases require a susceptible host, a pathogen and a conducive environment. All three must occur simultaneously in order for disease to develop. Therefore, alternative disease management focuses on modifying the host, pathogen and/or environment.

HOST

Host resistance: For an up-to-date list of crop varieties that are resistant to diseases of concern, check with your local county extension agent.

Disease-free plants: Purchase and plant disease-free plants and produce the propagating material in disease-free areas.

PATHOGEN

Biological controls: Biological fungicides such as *Bacillus subtilis* can be used to successfully manage many fungal diseases such as powdery mildew and black spot on roses.

Organic pesticides: Pesticides labeled for use in organic production are also available for certain diseases. Checking with a local extension agent can help producers make decisions about which ones and in what combination they should be used.

Sanitation: By cleaning up infected fruit/plant parts, growers can reduce the amount of spores/pathogen material that is present to initiate infection.

Crop rotation: Depending on the pathogen and how long propagules survive in the soil, crop rotation may be a viable option to manage certain soilborne plant pathogens. The specific rotation should avoid growing hosts of the pathogen in succession.

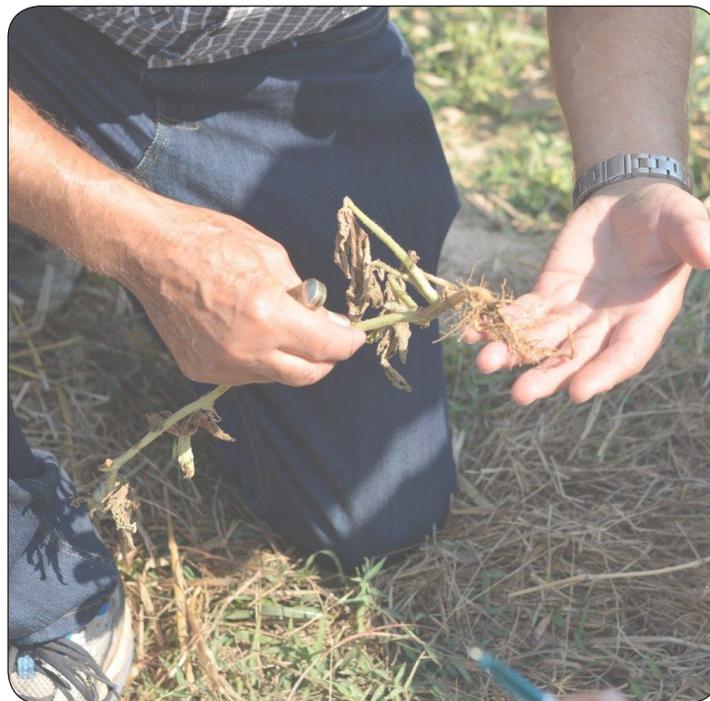
Planting/harvest date: Planting early in the season can increase the risk of seedling disease in some cases. Alternatively, late planting can increase the risk of yield loss. As with all management practices, creating a management regime should be tailored to specific diseases of concern.

ENVIRONMENT

Plant spacing: Increased plant spacing can allow greater airflow, thereby decreasing humidity and creating a less conducive environment for disease progression. Spacious planting can also increase the distance pathogen propagules must travel to land on susceptible host tissue. Recommendations for plant spacing for disease management can be obtained from a local extension agent.

Irrigation: Using a clean water source that is free of pathogen propagules is recommended. Overhead irrigation leads to leaf wetness and can create a conducive environment for foliar pathogens. Therefore, growers concerned with this may opt to switch to drip irrigation. In addition, overwatering may favor disease, so managing application rates may also be recommended.

Storage atmosphere: Generally, picking fruits and vegetables during cool, dry weather, thereby avoiding bruising, lessens disease spread. Additionally, storage conditions should generally be cool with low humidity. Specific recommendations can be obtained from a local extension agent.



NCAP'S WORK TO SUPPORT MANAGEMENT ALTERNATIVES: CASE STUDY – MUMMY BERRY

In 2011, NCAP partnered with Oregon State University and organic blueberry growers in the Willamette Valley to develop an organic management strategy for mummy berry disease of blueberries that could also be used by conventional growers as an alternative to pesticide use.

Mummy berry, a fungal disease of blueberries, can cause yield losses of up to 85%. Infected fruit, if left on the ground after harvest, produces a mushroom-like spore cup in early spring and initiates the disease cycle. NCAP produced a video in collaboration with Oregon State University to teach growers in the region about the mummy berry disease cycle and to demonstrate scouting techniques. Collaborative research with NCAP, Oregon State University and local, organic blueberry growers demonstrated that the number of spore cups produced in the spring could be dramatically reduced by mulching over the infected fruit with two inches of Douglas fir sawdust during the fall and winter preceding blueberry bud break (Florence and Pscheidt 2016). Other options include:

- **Sanitation:** Harvest and dispose of mummified fruit from bushes before they drop. After harvest, remove dropped fruit and plant debris from the ground and destroy plant debris that builds up on harvester machines before moving to a new field.
- **Raking/cultivation/chain-dragging:** Prior to bud break, shallow cultivation to a depth of one inch underneath bushes and in alleys has been shown to prevent spore cup development (Ngugi et al. 2002).
- **Cultivar selection:** Choose resistant cultivars if possible.

Useful resources for mummy berry disease:

NCAP Mummy Berry Page

http://www.pesticide.org/mummy_berry_management

Oregon State University Extension Publication

<https://catalog.extension.oregonstate.edu/sites/catalog.extension.oregonstate.edu/files/project/pdf/em9117.pdf>

Oregon State University Mummy Berry Blog

<http://blogs.oregonstate.edu/mummyberry/>



TRY IT OUT!

There are many ways to implement alternatives to pesticides on your farm or in your home garden. Whether you're dealing with insects, weeds or pathogens – all have management options that can be integrated into your current regime.

Now that you've received a brief introduction to each type of pest management, along with examples and resources, it's your turn to get outside and try one! The path towards an integrated pest management system begins one step at a time. So alter your crop rotation, research alternatives to pesticides on your particular crop and talk to your local extension agent.

If you're unsure about how well a specific technique will work, segregate a small plot in your farm or garden and test, monitor and evaluate the technique to give yourself a better idea of how well it'll work for your unique environmental conditions. There are plenty of resources in this guide to get you started.

Choosing alternatives to pesticides can help you manage pest resistance, decrease the costs of purchasing pesticides, limit your environmental impact, increase resiliency on your farm, help protect waterways and help you grow for specialized or organic markets.



FINANCIAL SUPPORT FOR ALTERNATIVES TO PESTICIDES

FEDERAL PROGRAMS

The decision to utilize alternatives to pesticides can come with certain financial costs. However, programs are available to offset these costs. Federal programs administered by the Natural Resources Conservation Service (NRCS), Farm Services Agency (FSA), Sustainable Agriculture Research and Education (SARE), and Agriculture Marketing Service are shown in Table 2. States and counties often have their own separate programs. Your county NRCS or FSA office or conservation district is a good place to start.

RISK MANAGEMENT

Growers reducing or eliminating conventional pesticides may be understandably concerned about the risk of crop loss. Fortunately, new programs provide assistance to reduce this risk for organic growers and specialty crop growers.

Organic: USDA's Risk Management Agency (RMA) permits crop insurance price elections that reflect the organic premium and the option for organic producers to insure their crop at the contract price. In addition, an organic premium surcharge was dropped after 2014. Organic crop insurance is available for organic acreage, transitional acreage and buffer zone acreage. Insurable causes of loss include insect damage, disease and weeds. Drift from adjacent, conventionally-grown crops is not a covered loss.

Whole Farm Revenue Protection: A new RMA insurance product, known as WFRP, covers all crops and livestock on a farm (which traditional farm or revenue insurance did not). This product is available for farms with specialty or organic commodities or those marketing to local, specialty or direct markets. WFRP protects against the loss of up to \$8.5 million in insured farm revenue. Catastrophic Risk Protection is not covered under this program. Crop insurance is sold and delivered solely through private crop insurance agents.

Table 2. Federal Programs

Program	Agency	What It Covers	More Details	Financial Benefit
PROGRAMS THAT DIRECTLY SUPPORT NON-CHEMICAL PEST MANAGEMENT PRACTICES OR COSTS				
Environmental Quality Incentives Program (EQIP)	NRCS	Examples of vegetative and structural conservation practices include terraces, manure waste lagoons, irrigation equipment, grassed waterways, filter strips, and wildlife habitat enhancement. Examples of management practices include conservation crop rotation, nutrient management, drainage management, and integrated pest management.	http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip/	Financial and technical assistance both available. Payments are made after conservation practices are implemented. Contracts can last up to 10 years. Cost-share up to 75% for the costs of certain conservation practices; up to 90% for certain producer categories.
EQIP Organic Initiative	NRCS	Activities to plan and implement conservation practices to support the environmental sustainability of organic and transitioning operations. Examples include: establishing buffer zones, installing pollinator habitat, improving irrigation efficiency, and enhancing cropping rotations and nutrient management.	http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/financial/eqip/?cid=nrcs143_008224	Financial and technical assistance both available; contract payments are capped at \$20,000 annually or \$80,000 over any six-year period.
SARE Producer Grants (Farmer/Rancher Grants)	SARE	Supports on-site experiments that can improve producer operations and the environment and can be shared with other producers. Grant recipients may also focus on marketing and organic production.	http://www.westernsare.org/Grants/Types-of-Grants	Individual farmers or ranchers may apply for up to \$20,000, and a group of three or more producers may apply for up to \$25,000. Grants can cover periods up to three years.
SARE Professional + Producer Grant	SARE	Similar in concept to the Producer Grants but project coordinator is an agricultural professional such as an extension educator or Natural Resources Conservation Service professional. A farmer or rancher serves as the project advisor.	http://www.westernsare.org/Grants/Types-of-Grants	Similar in concept to Producer Grants above.
Conservation Stewardship Program (CSP)	NRCS	Supports practices such as nutrient and pest management, cover crops, conservation tillage, crop rotations. Available for working lands targeting state/regional priority resource concerns.	http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/csp/	Five-year contracts, capped at \$200,000. Payments average \$18/acre.
National Organic Certification Cost Share	AMS	Assists certified organic operations in defraying the costs associated with organic certification.	https://www.ams.usda.gov/services/grants/occp	Reimbursements of up to 75% of annual certification costs, up to a maximum payment of \$750 per year, per farm.
PROGRAMS THAT SUPPORT ON-FARM HABITAT OR CONSERVATION BUFFERS FOR PROTECTION OF DOWNSTREAM SOIL AND WATER QUALITY				
Agricultural Conservation Easement Program (ACEP)	NRCS	Easements to protect farms from development or to conserve grazing land or restore or enhance wetlands.	https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/easements/acep/?cid	Cost-share: 50% of fair market value of easement provided by NRCS.
Conservation Reserve Program (CRP)	NRCS	Conserving soil, protecting water quality and providing wildlife habitat by establishing long-term cover on highly erodible land or land in need of conservation buffers that has previously been in row crop production. Examples include riparian buffers or filter strips.	https://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-program/index	Annual rental payment and up to 50% cost-share for implementing the practice. Additional incentives or bonuses may be available.
Conservation Reserve Enhancement Program (CREP)	FSA/NRCS	A subset of CRP, available where states establish agreements with FSA to address high priority environmental problems.	https://www.fsa.usda.gov/programs-and-services/conservation-programs/conservation-reserve-enhancement/index	Same as CRP.

Additional Resources

ATTRA - A National Sustainable Agriculture Assistance Program - <https://attra.ncat.org/>

Clean Plant Center Northwest – Washington State University www.healthyplants.wsu.edu

eOrganic – eorganic.info

eXtension – extension.org

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International Survey of Herbicide Resistant Weeds. Maintains searchable databases on weed resistance. <http://www.weedscience.org/>

National Agricultural Library. <https://www.nal.usda.gov>

National Sustainable Agriculture Coalition: <http://www.sustainableagriculture.net>

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SARE – Sustainable Agriculture Research and Education – www.sare.org
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USDA Risk Management Agency. www.rma.usda.gov

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ABOUT NCAP

Fifteen years ago, NCAP's report, *Poisoned Waters* (Lind, 2002), highlighted the issue of aquatic pesticide contamination.

Since then, NCAP has worked on a multi-pronged strategy to keep Northwest rivers clean for salmon and people. NCAP pushed for reforms in federal pesticide review and registration procedures and won interim buffers that restrict

applications of certain pesticides near thousands of miles of Northwest streams until those reforms are in place.

NCAP has also emphasized the need to reduce reliance on harmful pesticides by implementing alternative, ecologically-sustainable pest management practices. This guide continues that work by providing information on practices and resources for Northwest growers.



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The Northwest Center for Alternatives to Pesticides works to protect community and environmental health and inspire the use of ecologically sound solutions to reduce the use of pesticides.