Best Management Practices to Protect Water and Fish

OXYFLUORFEN

Pre- and post- emergent herbicide, broadleaf and grassy weeds, also sucker control

Products Include: Biathlon, CleanTraxx, Collide, Galigan, Goal, Goaltender, Double-O, OH2, Pindar, Oxyflo, Oxystar, Rout, Showcase (and some homeowner formulations)

OXYFLUORFEN IS A CONCERN IN OREGON'S WILLAMETTE VALLEY STREAMS

- Oxyfluorfen was detected in 16% of stream samples from Yamhill, Marion and Clackamas counties, from 2010-2015.[1]
- Oxyfluorfen moves into streams through drift, with eroded soil or from direct runoff after applications on impervious surfaces.

The Chemical Properties of Oxyfluorfen Predispose It to Be a Water Pollutant

Chemical Property	Oxyfluorfen Rank[2]	Why it Matters for Pollution
Soil Persistence (half-life)	Persistent	More persistent pesticides stick around, with increased opportunities to get carried to streams.
Bioconcentration	High	Pesticides that concentrate in fish or wildlife may harm the animal or create a hazard when eaten. Such pesticides are typically lipophilic (fat-loving) and may also accumulate (magnify) in the food chain.
Breakdown in Water	Resistant	Once in streams, pesticides can break down by reacting with water (hydrolysis), light (photolysis), or interacting with live organisms (metabolic). Oxyfluorfen is resistant to hydrolysis.

Rank: red – yellow – green shading above indicates relative risk of pollution (red high).

Concentrations Occasionally Exceed Levels Set to Protect Aquatic Life

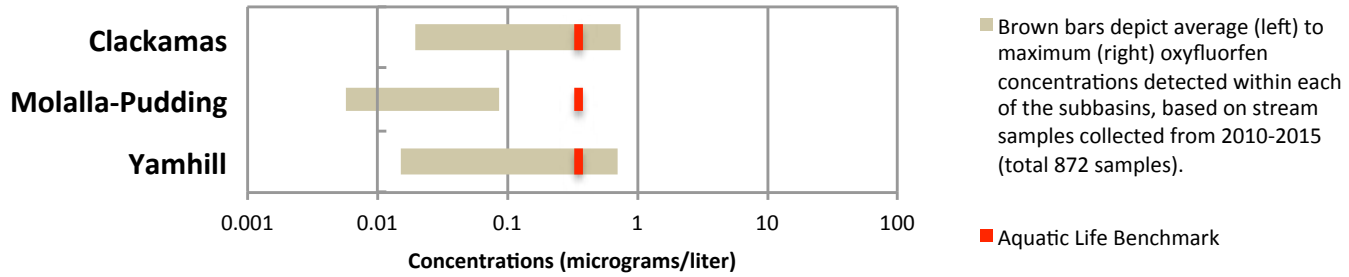

Photo: Bureau of Land Management

Harmful Effects of Oxyfluorfen to Salmon, Steelhead or Their Habitat

- A risk assessment analyzing uses for conifers predicted harm to sensitive aquatic insects and algae, without additional steps taken to prevent contamination of nearby aquatic habitats.[3]
- EPA concluded that some uses of oxyfluorfen may result in sublethal impacts to fish and aquatic invertebrates.[4]
- The U.S. Fish and Wildlife Service concluded that oxyfluorfen jeopardized the continued existence of certain endangered fish, plants and invertebrates and recommended a no-spray buffer of ¼ mile adjacent to endangered species habitat.[5]
- Oxyfluorfen has been documented concentrating in fish 450-2200 times levels in the surrounding water.[6]

Young hazelnut orchard. Cover crop of annual ryegrass between rows reduces runoff and erosion | Photo: Sharon Selvaggio

Pay Attention to the Label

- Labels for some **oxyfluorfen products require a 25 foot vegetative buffer strip** between treatment areas and lakes, reservoirs, rivers, permanent streams, marshes or natural ponds, estuaries, and commercial fish ponds.
- Labels warn that the product is **"toxic" or "extremely toxic" to aquatic invertebrates** and that runoff from treated areas may be hazardous to aquatic organisms in neighboring areas.
- Some labels require aerial applications to observe a ½ mile downwind buffer when winds are less than five mph, with limited exceptions.
- Labels indicate larger (but unspecified) downwind buffers when winds are 5-10 mph.

Registered Uses in Oregon

Foods: Various bearing and non-bearing tree fruits and berries, grapes, hazelnuts, wide range of vegetables and cereals
Grasses and Forage/Fodder: Grass seed (perennial rye, fescue, others), field corn, clover, fallow
Nurseries and Ornamental: Container and field grown ornamentals
Non-Crop: Buildings, fencerows, industrial sites, rights-of-way (roadsides and utilities)
Tree Crops: Christmas trees, conifers, forestry
Residential/Urban: Home garden, home outdoor, patio

Alternative Strategies to Reduce Weed Pressure

Try these alternative strategies to prevent and reduce weed pressure.

- Promote plant vigor and resistance by maintaining healthy soil,[7] and plant pest-resistant cultivars if available.
- Don't spread weed seeds. Clean equipment between use sites, especially when conditions have been muddy. Use clean seed.
- Use crop rotation to disrupt troublesome weeds. Good rotation strategies alternate crops, varying factors like: root depth and biomass; nitrogen fixing capacity, leaf density, alternate hosts, or time of sowing and development.[8] For example, slow-developing crops are susceptible to weeds and should follow weed-suppressing crops. In the Valley, summer field crops can be rotated with winter-active crops.
- Slow-establishing grasses grown for seed may be grown in alternate rows with small grain cereals or annuals to minimize weed establishment and provide earlier income, as was common before herbicides. According to Oregon State University, good commercial combinations include: wheat with orchardgrass and meadowfoam with perennial ryegrass.[9]
- Combine narrow row spacing with higher seeding rates and banded fertilizer. Trials using a combination of these techniques resulted in weed suppression six times higher than in trials using only a single practice.[10]
- For orchards, berries, grapes, or conifers, mulches (such as wood chips 3-4" thick) or landscape fabrics can reduce weed competition in new plantings and retain moisture but may promote rodents.[11]
- Scalping at least three feet circles around each seedling, followed by mulch, can slow competition from grasses and herbaceous weeds.
- Plant permanent grass or cover crop strips between rows in orchards, berries and vineyards to outcompete unwanted weeds and minimize erosion.[12]
- Try using shallow cultivation, flame weeding or mowing to address weeds where feasible.

Protect Fish – Keep it Out of the Water

Suggested Best Management Practices

Especially adjacent to permanent water bodies or on impervious or sloped sites or on bare soils

Reduce Erosion and Runoff:

1. Reduce application rates, spot spray or conduct banded applications.
2. Avoid application on impervious surfaces, especially when significant rainfall is expected.
3. For containerized crops, take care to ensure pesticide is applied only to pots.
4. Prevent erosion from treated sites. Techniques include:
   -Strip cropping (strips of perennial vegetation alternated with cultivated strips on contours),
   -"Perms" (grass strips) or cover crops between rows of Christmas trees, conifer plantations, berries or grapes,[13]
   -Reduced-tillage, which helps maintain organic material on site, holding soil in place,
   -Straw ropes laid across the contour on sloped forestry or Christmas tree sites to slow runoff and erosion.[14]
5. Infiltrate concentrated, channeled runoff leaving the treated sites using grassed waterways.[15]
6. Sediment-control measures such as grass-filter strips or sediment-retention ponds can be helpful. Such techniques trap sediment and promote infiltration, reducing pesticide loading to adjacent ditches and streams. While large variability exists, a review found, on average:[16]
   -a 17 ft. wide vegetative strip reduces pesticide loading by 50%,
   -a 33 ft. wide vegetative strip reduces pesticide loading by 90%,
   -a 67 ft. wide vegetative strip reduces pesticide loading by 97%.

Soil Erosion | Photo: East Multnomah Soil and Water Conservation District

Reduce Drift and Volatilization:

1. Apply by ground rather than air.
2. Apply only when wind speeds are between 2-8 mph and only when winds are blowing away from streams. Some sources suggest oxyfluorfen is volatile.[17] Avoid applications when temperatures are higher than 70°F.
3. Increase untreated setbacks (no-spray buffers) next to streams, especially for aerial applications or if no windbreak or drift barrier is present. Using a setback of 100 feet can reduce the drift fraction reaching streams to ~2% compared to no setback.[18]
4. Use shields, precision sprayers or other drift reduction technology. Adjust nozzles to coarse droplet sizes.

Pesticide Selection:

1. Use a pesticide that is less persistent and less toxic (check SDS sheets or talk to your crop consultant or extension specialist).
2. Avoid tank mixes and formulations containing multiple active ingredients, which may cause additive or synergistic effects.

1 Oregon Pesticide Stewardship Partnership Program data, 2010-2015. Samples collected 7-14 days apart during growing season. Sampling sites may not represent first-order streams and small, static water bodies adjacent to oxyfluorfen use areas, thus sampling data may underestimate true peaks and averages.
2 Rankings accord with categories used by National Pesticide Information Center (NPIC). Soil half-life and hydrolysis values from US EPA 2002. (endnote 4), p. 27.
3 2005. Forest Service oxyfluorfen risk assessment. P. 4-35.
4 US EPA 2002. Reregistration Eligibility Decision (RED) for Oxyfluorfen, Case No. 2490. https://archive.epa.gov/pesticides/reregistration/web/pdf/oxyfluorfen_red.pdf.
5 US FWS, 1986. Consultation on oxyfluorfen with US EPA. Cited in US EPA 2002 (endnote 4), p. 36.
6 Reibach P. 1990b. Rohm and Haas Company Phase 3 Summary of MRID 00096883. A Residue and Metabolism Study of Carbon-14-RH-2915 in Bluegill Sunfish: TR No. 34-23. Prepared by Chevron Chemical Co. 31 p. MRID 92136026.
7 Magdoff, F. and H. Van Es. 2009. Building Soil for Better Crops. USDA SARE program, http://www.sare.org/Learning-Center/Books/Building-Soils-for-Better-Crops-3rd-Edition.
8 Molher, C. 2009. The role of crop rotation in weed management. http://www.sare.org/Learning-Center/Books/Crop-Rotation-on-Organic-Farms/Text-Version/Physical-and-Biological-Processes-In-Crop-Production/The-Role-of-Crop-Rotation-in-Weed-Management.
9 Oregon State University Grass Seed Crops: http://cropandsoil.oregonstate.edu/system/files/classes/css460-560/Chapter_4.pdf.
10 Anderson, R. 2003. An ecological approach to strengthen weed management in the semiarid Great Plains. Advances in Agronomy 80: 33-62.
11 Oregon State University Extension. 2014. Introduction to Conifer Release. EC1388. Also see Iowa State University Forestry Extension. Weed Control for Seedlings.
12 NRCS Oregon. 2017. Willamette Valley hazelnut growers use cover crops to combat soil erosion. https://www.nrcs.usda.gov/wps/portal/nrcs/detail/or/newsroom/stories/?cid=nrcseprd1332825. Also see OSU Extension, 2014 (endnote 11).
13 Peachey, E., C. Landgren, and T. Miller. 2011. Weed and Vegetation Management in Christmas Trees. Pacific Northwest Extension Publication PNW 625.
14 Ibid.
15 Natural Resources Conservation Service. 2000. Conservation Buffers to Reduce Pesticide Losses.
16 European Crop Protection Association, 2009. Vegetative Buffer Strips, http://abe.ufl.edu/Carpena/files/pdf/software/vfsmod/VFS_Flyer_07_09_09__FINAL.pdf.
17 Mathers H. Herbicide injury. Michigan State University Extension. http://msue.anr.msu.edu/uploads/files/6-23%20Nursery%20grower%20checklist%20TOM%20herbicide%20injury.pdf
18 AgDrift model, US Forest Service Risk assessment (endnote 3), Table 3-6.

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NCAP works to protect community and environmental health and inspire the use of ecologically sound solutions to reduce the use of pesticides.

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