

# Pesticides likely to get into Groundwater on Vashon and Maury Islands

Michael Laurie and Diane Emerson, June 16, 2016

## Summary

Pesticide residues are found far and wide, but thankfully in most cases they are found at very low levels.

But greater than 36 percent of the samples tested by the United States Geological Survey, USGS, from major aquifers used for drinking water supplies contained pesticides. This indicates the vulnerability of aquifers to contamination from human activities at the land surface and the importance of wellhead protection.

There is still a lot we don't know about the impact of pesticide active ingredients, especially in terms of their interactions with each other and other chemicals and their breakdown products.

The only pesticide found in 2 percent or more of the 1,271 wells sampled by USGS in their latest study that is for sale on Vashon is 2,4-D which is in Weed and Feed. 2,4-D has also been found harmful to salmon by National Marine Fisheries Service studies in Puget Sound.

## Summary of research

Summary of findings from 'Pesticides in the Nation's Streams and Groundwater, 1992 - 2001 - A Summary, USGS'

The *insecticides* most commonly found were chlordane, carbaryl, malathion, diazinon, and carbofuran. The *herbicides* most commonly found were atrazine, metolachlor, acetochlor, trifluralin, and cyanazine. Trifluralin, simazine, and prometon were used residentially. 2,4-D was found overwhelmingly in urban areas because it is lawn care products. Pyrethroids were found and they are highly toxic to aquatic organisms.

Of the pesticides found most frequently in this study, the ones found in products for sale on Vashon in 2016 were the herbicides 2,4-D and trifluralin, insecticides malathion and carbaryl and pyrethroids.

Summary of findings in 'Quality of Streamwater in the Puget Sound Basin - A Decade of Study and Beyond'

The 3 most commonly found pesticides in Thornton Creek in Seattle were the herbicide prometon, the insecticide carbaryl, and the Glyphosate degradation compound, aminomethylphosphonic acid, AMPA.

Carbaryl has been found by NMFS to be very harmful to salmon and thankfully only one product containing Carbaryl is for sale on Vashon in 2016. No products containing prometon were for

sale on Vashon in 2016. Roundup products which contain Glyphosate continue to be some of the top sellers on Vashon.

Summary of findings in the USGS study 'Pesticides in Groundwater of the United States; Decadal-Scale Changes, 1993 - 2011'

Overall one or more pesticides were found in 51 percent of the samples they collected in decade 1 and 54 percent in decade 2. The highest frequencies of detection were in shallow groundwater beneath agricultural land use areas. Although pesticides were detected in about half of the samples taken from shallow groundwater below urban areas and more than 1/3 of samples from deep aquifers. -

Pesticide concentrations seldom exceeded human-health benchmarks in groundwater.

Atrazine, deethylatrazine, metolachlor, simazine, prometon were the ones found most frequently in the major nationwide study of pesticides carried out between 1993-2011 by the USGS.

In contrast, three herbicides commonly used in urban areas—simazine, prometon, and tebuthiuron—were detected more often in urban streams than in agricultural streams. Finally, insecticides were found much more frequently in urban streams than in most agricultural streams with diazinon, chlorpyrifos, carbaryl, and fipronil most frequently detected. Overall, results for each individual pesticide reveal a unique pattern of distribution resulting from its primary uses, the distributions of land uses and crops, and the chemical and physical properties of the pesticide.

Of the pesticides found in 2 percent or more of the samples tested in this study, the only one found in products for sale on Vashon in 2016 was 2,4-D.

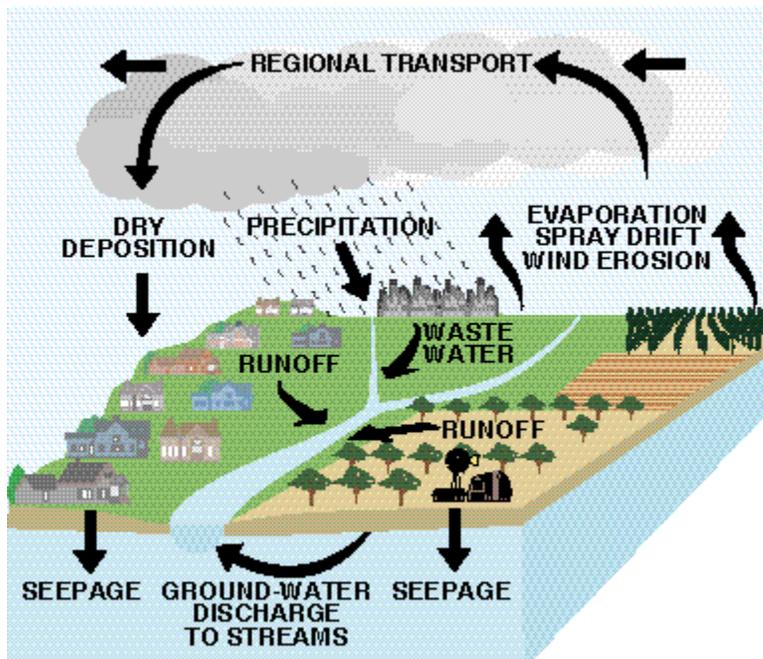
Pathways of pesticide movement

See the graph below for some of the many ways that pesticides can move through the hydrological cycle. It is an attention getter to see that pesticides can be transported by evaporation, spray drift, wind erosion, runoff, wastewater plant outfalls, seepage, groundwater discharge to streams, and more. For example, Glyphosate, the active ingredient in Roundup products, has been found in rain. And many pesticides can become airborne and travel long distances.

Pesticides in streams vary seasonally, largely based on changes in seasonal use. It is best to try to get an understanding of which pesticides are used and when, and use that knowledge to test for pesticides when use is high and when runoff is greatest.

Groundwater is more vulnerable to pesticide contamination where the aquifer is shallow and where the soils are highly permeable. Vashon property owners on their own wells with permeable soil should be alerted to this possibility.

Testing for pesticides is expensive. Generally groundwater responds slowly to changes in pesticide use.



Pathways of pesticide movement in the hydrologic cycle.  
Modified from Barbash and Resek 1996, USGS

### Weaknesses of EPA federal standards on pesticides, reasons for continued caution with pesticides

USGS criticized EPA for;

- not setting adequate water quality standards for pesticides,
- not setting values for many pesticides
- not considering mixtures and breakdown products of pesticides
- not considering seasonal exposures
- and dragging their feet on setting standards for endocrine disrupters

EPA did issue a document in 2012 that set guidelines for 350 chemicals but did not set any federal requirements for any of them.

Impacts on wildlife from some pesticides sometimes have been documented at levels determined by the EPA to be safe for humans. According to the Beyond Pesticides publication 'Threatened Waters Turning the Tide on Pesticide Contamination', frogs exhibit hermaphroditism when exposed to legally allowable levels of the herbicide atrazine in waterways. According to USGS work and the publication 'Organic Land Management and the Protection of Water Quality', atrazine, chlorpyrifos, endosulfan, and metolachlor are endocrine disrupters.

## Recommendations

- Put greater emphasis on encouraging people to stop their use of Weed and Feed
- Consider periodically testing a few Vashon water sources for presence of commonly used pesticides like 2,4-D and Glyphosate. Consult with staff in the Tacoma USGS office to determine which products to test for.
- Remind people that pesticides can travel long distances from where they are applied.
- Recommend that island water utilities and all islanders not use pesticides close to their water sources, especially in areas of shallow aquifers.

## Bibliography

Quality of Streamwater in the Puget Sound Basin - A Decade of Study and Beyond, Sandra Embrey and Patrick Moran, Washington Water Science Center, Tacoma, WA, 2006

Pesticides in Groundwater of the United States: Decadal-Scale Changes, 1993–2011 by Patricia L. Toccalino<sup>1</sup>, Robert J. Gilliom<sup>2</sup>, Bruce D. Lindsey<sup>3</sup>, and Michael G. Rupert<sup>4</sup>, United States Geological Survey

Pesticides in the Nation's Streams and Groundwater, 1992 - 2001 - A Summary, USGS

May 2016 conversation with John Clemons, USGS Outreach Coordinator, 253-552-1635, [jclemons@usgs.gov](mailto:jclemons@usgs.gov)

Review of Grow Smart Grow Safe database for presence of pesticides mentioned in USGS study

Review of Garden Green cards database based on Pharos database for presence of pesticides mentioned in USGS study

Threatened Waters by Nichelle Harriott and Jay Feldman, Beyond Pesticides, 2011

'Pesticides in My Drinking Water', Drew Toher, Beyond Pesticides,