



Water: What's in it (for us)?

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Clinton Water Forum
March 13, 2010

Oversight of private wells

Drinking water from domestic wells is not regulated by federal standards and typically does not receive the same level of monitoring and treatment as drinking water supplied by public water systems...The quality of water from privately owned domestic wells is the homeowner's responsibility.

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Overview

Regarding our health:

- What's in our well water?
- What's in Puget Sound?
- Where does contamination come from?
- What are the health issues?
- What do we do about it?



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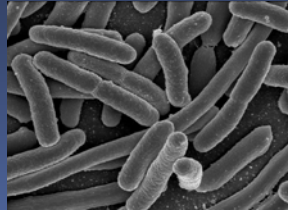
What's in our well water?

- Pathogens: bacteria, viruses, protozoa
- Natural contaminants: salt, radon
- Metals and minerals: arsenic, lead, copper and mercury
- Industrial chemicals: VOCs, nitrates, pesticides, PCBs and PBDEs
- Household chemicals: pharmaceuticals, cleaning products, cosmetics, plastics

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Pathogens

- Bacteria: campylobacter, E. coli, salmonella, shigella
- Viruses: enterovirus, Hepatitis A, norovirus, rotavirus
- Protozoa: cryptosporidium, giardia



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Pathogens: sources

Pet/livestock waste and malfunctioning septic systems



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Pathogens: prevention

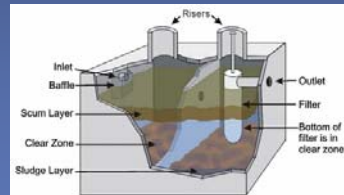
- Clean up pet waste and dispose of it in the trash
- Keep pets/livestock away from well heads
- Manage water flow on your property to prevent waste from accumulating in sensitive areas



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Pathogens: prevention

- Test your well every year and after replacing or repairing any part of the system, or if you notice any change in your water's look, taste, or smell. (US EPA 2003)
- Maintain your septic system:
 - Inspect once every 3 years, or every year for some systems (Washington state law)
 - Pump regularly, usually every 3 to 5 years

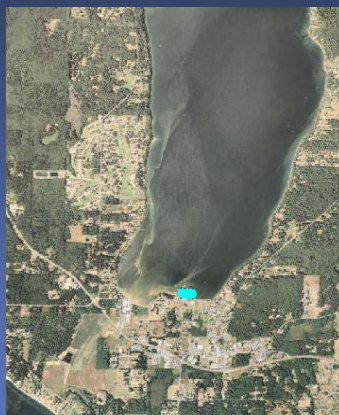


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Pathogens: prevention

- Follow advisories regarding fish and seafood consumption
- Washington Department of Health Shellfish Safety Information:

<http://ww4.doh.wa.gov/scripts/esri/map.dll?name=BIOVIEW&Left=587799&Bottom=337200&Right=1337201&Top=1360000&Beach=Select+a+Beach&Step=1&click.x=226&click.y=128>



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Pathogens: resources

- US Centers for Disease Control and Prevention (CDC)

- Water-related Diseases and Contaminants in Private Wells

www.cdc.gov/healthywater/drinking/private/wells/diseases.html

- Fact Sheet: Contaminants in Well Water

www.cdc.gov/ncidod/dpd/healthywater/factsheets/pdf/contaminants.pdf

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Pathogens: more resources

- Island County
 - Drinking Water Program
www.islandcounty.net/health/envh/Default.htm
 - Our Islands, Our Water, Our Future
www.islandcounty.net/Planning/documents/GuidetoCleanWater.pdf



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Pathogens: more resources

- National Drinking Water Clearinghouse
 - Preventing Well Contamination
www.nesc.wvu.edu/pdf/dw/publications/ontap/2009_tb/prevent_well_contamination_DWFSOM57.pdf
- University of Wisconsin Extension
 - Pet Waste and Water Quality
<http://clean-water.uwex.edu/pubs/pdf/home.pet.pdf>



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Pathogens: more resources

- Island County Public Health:
Onsite Sewage (Septic) Systems
<http://www.islandcounty.net/health/liquid/index.htm>
- Septic System Failures
<http://www.americanseptic.com/systemfailure.htm>



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Natural contaminants

- Saltwater intrusion
- Radon



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Natural contaminants: Saltwater intrusion

- The best prevention is conservation
- State of Washington
Department of Health / Island County Health
Department Salt Water Intrusion Policy
<http://islandcounty.net/health/Envh/DrinkingWater/documents/03.SaltWaterIntrusionPolicy2002.pdf>



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Natural contaminants: Radon

- A natural product of the breakdown of uranium in the soil
- Most dangerous when inhaled
- Less dangerous when consumed in water but remains a risk to health
- Using household water containing radon contributes to elevated indoor radon levels

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Natural contaminants: Radon

- Prevention and management
 - Point of entry treatment
 - Aeration treatment
- Resources
 - US EPA: Consumer's Guide to Radon Reduction: How to fix your home
<http://www.epa.gov/radon/pubs/consguid.html#Radon in Water>
 - Washington State Department of Health Radon Outreach Program
<http://www.doh.wa.gov/ehp/rp/environmental/radon.htm>

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Metals and minerals

- Arsenic
- Copper
- Lead
- Mercury



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Metals and minerals: Arsenic

Health effects

- Stomach pain
- Nausea, vomiting
- Diarrhea
- Numbness in hands and feet
- Partial paralysis
- Blindness
- Skin damage
- Circulatory system problems
- Increased risk of cancer
- Impaired intellectual function in children
- Psychiatric disorders
- Death (not of concern from arsenic in water)

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Metals and minerals: Arsenic

Sources of contamination

- Natural deposits in soil
- Treated lumber in decks, outdoor furniture, playgrounds, etc.
- Fertilizer from animal waste from treated livestock
- Runoff from old orchards
- Runoff from glass or electronics production waste



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Metals and minerals: Arsenic

Prevention and management

- Paint exposed surfaces of treated wood
- Test water in late summer and early spring
- Filter contaminated water – be sure to check that the filter removes arsenic
- Find an alternate water source
- Bathing and washing dishes is not of concern

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Metals and minerals: Arsenic

Resources

- Washington Department of Health: Arsenic and Your Private Well
www.doh.wa.gov/ehp/oehas/publications_pdf/ArsenicBrochure.pdf
- Natural Resources Defense Council: Arsenic in Drinking Water
www.nrdc.org/water/drinking/qarsenic.asp
- Dartmouth Toxic Metals Research Program: *In Small Doses: Arsenic* video
www.dartmouth.edu/~toxmetal/InSmallDoses/

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Metals and minerals: Copper and lead

- Health effects of lead
 - Delayed physical and mental development in babies
 - Shortened attention span, hearing, and learning abilities of children
 - Slightly increased blood pressures in adults
 - Long-term exposure at high levels can include stroke, kidney disease and cancer
 - Damage to the brain, kidneys, nervous system, and red blood cells
- Health effects of high exposures to copper
 - Upset stomach, vomiting, diarrhea, and stomach cramps
 - Liver and kidney problems

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Metals and minerals: Copper and lead

Sources in drinking water

- Lead and copper plumbing pipes and solder
- Brass or chrome-plated brass faucets and fixtures
- Increased leaching with corrosive water
- Increased leaching with hot water



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Metals and minerals: Copper and lead

Industrial releases of lead on Whidbey Island

- In 2008, the Department of Defense reported that 1662 pounds of lead were released, 21 pounds into the air and 1641 pounds on or under the ground.

*from the Right-to-Know Network
using data from the US EPA's Toxic
Release Inventory database*



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Metals and minerals: Copper and lead

Prevention and management

- Use only cold tap water for drinking and cooking
- Run water 1-2 minutes if a faucet has not been used for 6 hours or more
- Heating or boiling water does not remove lead



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Metals and minerals: Copper and lead

Resources

- US Centers for Disease Control and Prevention: Lead and Drinking Water from Private Wells
www.cdc.gov/healthywater/drinking/private/wells/disease/lead.html
- US Environmental Protection Agency: Lead in Drinking Water
www.epa.gov/OGWDW/lead/index.html



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Metals and minerals: Mercury

Sources in Puget Sound

- Consumer products: thermometers, switches, fluorescent light bulbs
- Industrial pollution
- Dental office discharges

Affects human health via fish consumption



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Metals and minerals: Mercury

Health effects

- Mental retardation
- Neurobehavioral delays and deficits
- Cardiac functioning
- Tremors
- Vision, hearing and memory problems
- Speech difficulties
- Damage to kidneys and lungs
- Psychological disorders

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Metals and minerals: Mercury

Prevention and management

- State mercury reduction chemical action plan started in 2003
 - Eliminates or reduces the use of mercury in consumer products
 - Reduces mercury discharges from hospitals and dental offices
 - Collect mercury-laden thermostats and fluorescent lamps
 - Collect switches from junked autos

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Metals and minerals: Mercury

Resources

- Washington Department of Ecology: Fact Sheet: How Washington is working to reduce PCBs and mercury in Puget Sound
www.ecy.wa.gov/pubs/0601011.pdf
- Learning and Developmental Disabilities Initiative Practice Prevention: Mercury
www.healthandenvironment.org/?module=uploads&func=download&fileId=677

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Industrial chemicals

- Volatile organic compounds (VOCs)
- Pesticides
- Nitrates
- PCBs



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Industrial chemicals: VOCs

- Organic chemicals that have a high vapor pressure relative to its water solubility
- Move between the atmosphere, soil, surface water and groundwater
- Persist for long periods
- Found in
 - Solvents
 - Paints, varnishes and sealants
 - Adhesives
 - Deodorizers
 - Refrigerants
 - Fuels
 - Fumigants
 - Disinfection by-products

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Industrial chemicals: VOCs

Health effects

- Some are eye, skin, and/or throat irritants
- May cause drowsiness or unresponsiveness
- May affect cognitive abilities, balance, and coordination
- Some are known carcinogens
- May adversely affect the liver, kidneys, spleen and stomach, as well as the nervous, circulatory, reproductive, immune, cardiovascular, and respiratory systems

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Industrial chemicals: VOCs

Sources in drinking water

- Nonpoint source pollution: runoff from roads and fields
- Industries that use fuels, solvents, paints, and other VOC-containing materials



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Industrial chemicals: VOCs


Prevention and management

- Do not pour or flush fuels, solvents, paints, adhesives and other materials into your septic system or onto the ground
- Minimize vehicle use
- Test your well water if you live within 1 mile of a gas station or another high-risk site
- Granular activated-carbon filtering systems and filters mounted on taps and refrigerator dispensers will filter VOCs

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Industrial chemicals: VOCs

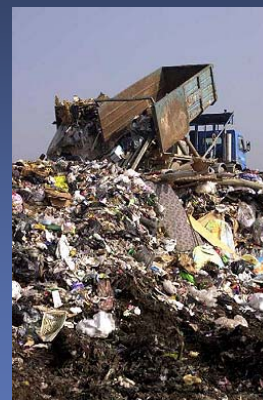
Resources

- US Environmental Protection Agency: 
Fact Sheets
<http://www.epa.gov/safewater/hfacts.html#Volatile>
- Occurrence and Potential Human-Health Relevance of Volatile Organic Compounds in Drinking Water from Domestic Wells in the United States. *Environmental Health Perspectives*, November 2007.
www.ncbi.nlm.nih.gov/pmc/articles/PMC2072842/

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Industrial chemicals: Nitrates

- Come from the breakdown of nitrogen compounds in the soil
- Usually due to human activities
 - Septic systems
 - Fertilizer runoff
 - Animal manures
 - Sanitary landfills and garbage dumps
 - Rotting vegetation
- Picked up by flowing groundwater



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Industrial chemicals: Nitrates

Health effects

- Can cause methemoglobinemia, a blood disorder with long-term effects
- Particularly threatening to infants (“blue baby syndrome”), pregnant women and anyone with a compromised immune system

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Industrial chemicals: Nitrates

Prevention and management

- Control animal waste
- Minimize use of inorganic fertilizer
- Buy organic food when you can
- Test private wells every year
- Treat your septic system gently
 - Distribute water use throughout the day and throughout the week
 - Don't put in excessive food waste or chemicals that can kill the microorganisms in your system



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Industrial chemicals: Pesticides

Used to kill or repel insects, fungi, mold, bacteria, weeds and other vegetation, rodents and other pests



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Industrial chemicals: Pesticides

Health effects of lower levels or chronic pesticide exposure:

- Stinging eyes
- Itchy skin
- Twitching, muscle aches, stiffness, spasms or tremors
- Paralysis
- Learning, behavioral, and developmental disabilities
- Loss of appetite
- Behavioral/mood disturbances (including confusion, excitement, mania, disorientation, or moodiness) and depression
- Evidence linking pesticide exposure to Parkinson's disease

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Industrial chemicals: Pesticides

Prevention and management:

- Integrated Pest Management (IPM)
<http://toxipedia.org/display/ipmopedia/IPM+Education+Project>
- Use and dispose of pesticides according to package directions
- Buy organic food when you can
- If your well is contaminated, you'll need to dig a new well or find an alternate water source

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Industrial chemicals: Pesticides

Resources

- University of California at Davis Integrated Pest Management Program: Pesticides and Water Quality
www.ipm.ucdavis.edu/WATER/U/index.html
- Wisconsin Department of Natural Resources: Pesticides in Drinking Water
www.dnr.state.wi.us/org/water/dwg/pubs/pesticides.pdf

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Industrial chemicals: PCBs and PBDEs

Polychlorinated biphenyls

- Mixtures of up to 209 individual chlorinated compounds
- Can be oily liquids, vapor in air or solids
- Before being banned in 1976, they were used as coolants and lubricants in hundreds of industrial and commercial applications
- Chemically stable – persist for long periods

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Industrial chemicals: PCBs and PBDEs

Health effects of PCBs

- Abnormal development of the nervous system
- Immune system
- Thyroid toxicity
- Skin and eye problems
- Menstrual disturbances and lowered male fertility
- Increased rates of cancer at several sites, particularly the liver, biliary (gallbladder) tract, intestines and skin

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Industrial chemicals: PCBs and PBDEs

PBDEs

- Flame-retardant chemicals added to some fabrics and plastics
- 2007 law banned use in Washington state beginning in 2008
- Health effects:
 - Altered brain development
 - Decreased thyroid hormone
 - Damage to immune and reproductive systems

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Industrial chemicals: PCBs and PBDEs

Sources

- Not usually a problem in well water except with leaks from older well pumps
- Contamination in Puget Sound
 - Fish, especially Puget Sound salmon (chinook)
 - Bioaccumulate
 - Concentrate in fats and skin



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Industrial chemicals: PCBs and PBDEs

Prevention and management

- Remove skin from Puget Sound fish
- Cook fish so that fat drips away
- Limit fish consumption by pregnant women and children

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Industrial chemicals: PCBs and PBDEs

Resources

- Practice Prevention columns from the Learning and Developmental Disabilities Initiative
www.healthandenvironment.org/working_groups/learning/r/prevention

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Household chemicals

- Pharmaceuticals
- Cleaning products
- Cosmetics
- Plastics



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Household chemicals: Pharmaceuticals

Sources in drinking water

- Flushing of expired/unneeded medications
- Body fluids



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Household chemicals: Pharmaceuticals

Prevention and management

- Take-back programs
- Do not flush: Mix pills with cat litter or coffee grounds, seal and place in trash



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Household chemicals: Pharmaceuticals

Resources

- A Safer Way to Dispose of Unwanted Household Medicines
www.islandcounty.net/health/envh/SafelyDisposeMedications-May09.pdf
- Island County Public Works Department: Pharmaceutical Waste Disposal Interim Policy, 2008
www.islandcounty.net/health/Envh/MedicationDisposal.pdf
- US Geological Survey: Pharmaceuticals, Hormones, and Other Organic Wastewater Contaminants in U.S. Streams
<http://toxics.usgs.gov/pubs/FS-027-02/>

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Household chemicals: Cleaning products

Substances of concern to human health

- Ammonia and ammonium quaternary compounds
- Solvents and other VOCs
- Disinfectants, including chlorine and triclosan
- Lye
- Hydrochloric acid
- Sulfuric acid
- Phthalates in fragrances
- Nanoparticles



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Household chemicals: Cleaning products

Possible health issues in drinking water

- Irritation to skin, lungs, digestive tract
- Reproductive harm
- Cancer
- Birth defects
- Liver and brain toxicity



Cleaners can also harm septic systems

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Household chemicals: Cleaning products

Prevention and management

- Use earth-friendly products
- Make your own nontoxic cleaning products
 - Baking soda
 - Vinegar
 - Lemon juice



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Household chemicals: Cleaning products

Resources

- Health Care Without Harm: Cleaners and Disinfectants
www.noharm.org/us_canada/issues/toxins/cleaners_pesticides/cleaners.php
- US National Library of Medicine/National Institutes of Health: Household Products Database
<http://householdproducts.nlm.nih.gov/cgi-bin/household/prodtree?prodcats=Inside+the+Home>



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Household chemicals: Cleaning products

Resources

- Women's Voices for the Earth: Safe Cleaning Products Initiative
www.womenandenvironment.org/campaigns/sandprograms/SafeCleaning/getinformed
- Clean House Clean Planet
www.powells.com/biblio?inkey=74-0671535951-0&PID=31721&PID=31721
- Better Basics for the Home
www.randomhouse.com/catalog/display.pperl?isbn=9780609803257



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Household chemicals: Cosmetics

Substances of concern in cosmetics

- Phthalates
- Parabens
- Solvents, alcohol, formaldehyde and other VOCs
- Nanoparticles



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Household chemicals: Cosmetics

Possible health concerns in water

- Cancer and gene damage
- Fertility problems
- Harm to brain development
- Thyroid disturbances
- Psychological disorders



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Household chemicals: Cosmetics

Prevention and resources: Use less-toxic products

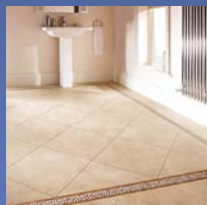
- Environmental Working Group: Skin Deep database
www.cosmeticsdatabase.com/
- US National Library of Medicine/National Institutes of Health: Household Products Database
<http://householdproducts.nlm.nih.gov/cgi-bin/household/prodtree?prodcats=Personal+Care>

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Household chemicals: Plastics

Chemicals of concern

- Bisphenol A (BPA)
- Phthalates
- Lead, cadmium and mercury
- PBDEs
- Dioxins



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Household chemicals: Plastics

Possible health effects in water

- Reproductive harm
- Cancer
- Asthma and allergies
- Impaired thyroid and pituitary function
- Harm to brain development
- Diabetes
- Endometriosis
- Birth Defects
- Immune system depression
- Psychological and behavioral disorders

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Household chemicals: Plastics

Prevention

- Avoid plastics that leach dangerous chemicals: PVC #3, polystyrene #6, and “other” #7 (includes polycarbonate plastic)
- Recycle plastic containers when possible
- Use alternatives to plastic: wood, glass, canvas, metal, and so on



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Household chemicals: Plastics

Resources

- Learning and Developmental Disabilities Initiative
Practice Prevention: Plastics
www.healthandenvironment.org/?module=uploads&func=download&fileId=687
- Ecology Center: Adverse Health Effects of Plastics
www.ecologycenter.org/factsheets/plastichealtheffects.html
- Center for Health, Environment & Justice: PVC: The Poison Plastic
www.besafenet.com/pvc/

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Endocrine-disrupting chemicals

- Interfere with the body's ability to regulate its growth, development, metabolism and other functions
- Produce effects in very small amounts
- Include many pesticides, BPA, VOCs, dioxins, PCBs, phthalates, metals

Resource

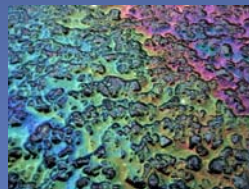
- Learning and Developmental Disabilities Initiative Practice Prevention: EDCs
www.healthandenvironment.org/?module=uploads&func=download&fileId=773

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Summary

“If it's on the land, it will end up in the water.”

Seattle PI, When it rains, it pours pollutants into the waters, November 2002



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Summary

Ask your elected officials to implement strong water monitoring programs.

Take personal responsibility for the functioning of your well and septic system.

Water on Whidbey is essentially clean and safe.
Let's keep it that way.

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