Chemicals And Solvents

ISSUE

Common, everyday chemicals [A]such as motor oil, gasoline, paint and thinners, waxes, and nail-polish remover are toxics known as hazardous waste. All of these chemicals can make their way to Long Island Sound and result in the death or poison of creatures ranging from invaluable microscopic soil bacteria to beautiful harbor seals. Thinking before purchasing and proper disposal are two easy ways to ensure that your everyday hazardous wastes do not result in further degrading of the Sound.

How can my paint harm plants and animals living in the water?

PROBLEM

These chemicals and solvents contain many harmful ingredients, including lead, cadmium, mercury, copper, lithium, zinc, manganese, nickel, and bromide which can poison and kill plants, animals, and other organisms, leading to an imperiled natural environment and threatened human health.

Okay, I knew that these kinds if chemicals were toxic, but how do they get all the way to the Sound from my house?

Methods of Travel:

FROM THE GROUND…

One of the most common causes of chemical pollution is improper disposal. Otherwise, well-intended individuals dump chemicals, oil, gasoline, and paint thinners on the ground. This is not good for the ground or the Sound and it is illegal!

Anything dumped on the ground will travel over or through the ground and then downhill to gutters, storm drains[B], ponds and streams, until they arrive in your local bay or harbor and then to the Sound. For more information on how this happens click here[C].

FROM THE SINK…

Anything dumped in the sink or toilet bowl flows directly to either your septic system[D] or a town sewage plant[E]. These systems are designed to treat human waste like feces; neither of these systems can properly treat household chemicals, which pass through into ground water or your bay, harbor, or the Sound.

FROM LEAKS…

Another route for these chemicals is from leaking machinery, especially autos: cars, sport utility vehicles, and trucks. Engine fluids drip on the ground and you know the rest…it *goes in the Sound*. Engines that appear to be dripping just a few drops of oil, gas, antifreeze, or transmission fluid can leak gallons in a year…this adds up!! While most people think that large oil tanker spills constitutes the bulk of oil contamination, the fact is that only 5% of marine pollution comes from such spills. It is the leaky oil pan on an automobile, the home oil change that washes spills down the storm drain, and overall improper disposal that causes 95% of the water contamination caused by oil. Only one quart of oil can contaminate up to two million gallons of drinking water!

FROM THE TRASH…

Dumping on the ground is not the only disposal method that is harmful (and illegal). Household chemicals or hazardous wastes DO NOT belong in the trash.

- Via Landfill[F]*:* any of the chemicals from the landfill can leak (or leach[G]) out and get into our streams, lakes, rivers…and the Sound. "In industrial landfill leachate, 32 chemicals cause cancer; 10 cause birth defects, and 21 cause genetic damage; in municipal landfill leachate, 32 chemicals cause cancer, 13 cause birth defects, and 22 cause genetic damage."[1]

- Via *Trash Incineration*: they are a major source of 210 different dioxin compounds, plus mercury, cadmium, nitrous oxide, hydrogen chloride, sulfuric acid, fluorides, and particulate matter small enough to lodge permanently in the lungs.[2] As mentioned below, what goes in the air will land in the Sound (see atmospheric deposition[H]).

FROM THE AIR…

Surprised? What goes up must come down.

Surface water, ground water and the atmosphere are all linked in a hydrologic cycle therefore, the stuff that gets into the air eventually gets in the water – it falls to the ground and runs off or it falls directly into the water. When you can "smell" a chemical, such as paint thinner, you are actually breathing that chemical, which is in the air. Eventually, this air-borne chemical falls back to the ground in snow and rain (*e.g.*, acid rain). One of the most significant sources of this type of pollution is auto exhaust. Others include fumes from open containers and smoke from burning solvents. This process of going up and coming down is known as atmospheric deposition.

So now the chemicals are in the Sound, but how can that paint can really affect the environment*?*

Environmental Impacts:

These toxic substances, when they reach our lakes, streams, bays, and Long Island Sound, can cause death or reproductive failure in the fish, shellfish, and wildlife that use the habitat. In addition, they can accumulate in animal and fish tissue (leading to fish consumption advisories), become attached to sediments, or find their way into drinking water supplies, posing long-term health risks to humans. Particular negative include the following:

- **Impairment of the nervous system:** Lead and mercury are components of many household chemicals. When overexposed, animals can suffer from lead or mercury poisoning[I]- resulting in death
- **Mutations:** Over time species mutate to develop "immunity" to a new threat, in this case pollution, so that they can survive as a species.
- **Oxygen Depletion** or hypoxia[J] caused by Antifreeze, Slicks from oil, fuel, and solvents can starve aquatic animals of the oxygen required for their existence by preventing the natural (and necessary!)

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[1] Rachel's Hazardous Waste News #90, August 15, 1988, Environmental Research Foundation, P.O. Box 5036, Annapolis, MD 21403 http://www.ejnet.org/rachel/rhwn090a.htm

[2] Zero Waste America, c/o Lynn Landes, 217 S. Jessup Street, Philadelphia, PA 19107, (215) 629-3553 http://www.zerowasteamerica.org/Incinerators.htm

process of oxygen entering the water from the air causing reduced growth or the elimination of fish by either death or emigration.

- **Reduction of Species Variety**: The bounty of organisms that live on or in the sediments on the bottom of the Sound (and other water bodies) are killed off and are replaced by only a few pollution-tolerant species. Their predators – fish and birds – either move (emigrate) or die from lack of prey
- **Reduce Light Penetration,** caused by slicks and excess algae[K], decreases the amount of light available to aquatic plants.
    - Light reduction reduces the growth of plants, such as eelgrass, that provide vital underwater food and shelter. In turn, the animals that depend on those plants either emigrate or die. Additionally, less light results in poor visibility, making it difficult for animals to find prey and avoid predators.
    - Fewer plants, such as eelgrass, are a principle reason for the loss of scallops from many parts of the Sound and its bays.
- **Toxins** accumulate in the flesh of animals, from benthic worms to striped bass. These toxins are passed up through the food chain at increasing concentrations until they reach top predators.
    - Only one gram of mercury (about the amount found in a traditional thermometer) can make the fish in a 20-acre lake unsafe to eat for one year.
    - The Bridgeport Harbor coal-burning power plant that presently releases 60,781 grams (134 pounds) of mercury per year.
    - Mercury, a persistent and toxic pollutant, bioaccumulates in the environment as it rises up the food chain. Consumption of mercury-contaminated fish poses a significant public health threat and all of the Northeastern states have issued freshwater fish advisories, warning certain individuals against consuming from many affected water bodies.[3]
    - For information on Connecticut Fish Advisories: http://www.dph.state.ct.us/Publications/BCH/EEOH/fish01.pdf

SOLUTION

BEFORE YOU PURCHASE…

Do you need it?

If possible, use elbow grease instead of chemicals – *i.e.*, use a plunger or a plumber's snake instead of a chemical drain opener.

If possible, avoid using the most toxic chemicals, usually contained in furniture strippers, turpentine, lighter fluid, paint thinner, nail-polish remover, fuels, lubricating oils, furniture polishes, spot removers, glues, paints, wood finishes. Words such as corrosive, flammable, reactive, toxic, danger, poison, combustible, petroleum, benzene, carbon tetrachloride, chlorinated solvents, and mercury biocides are all indicators of a potentially harmful product.

If you need it:

Ask your neighbors if they have any leftovers.

[3] http://www.cbia.com/MemCncl/EnvPol/DEP/depsummary02.htm

Seek the least hazardous products, such as water-based (latex) paints, adhesives, cleaners, finishes and avoid solvent-based products.

- See Household Hazardous Waste Disposal and Alternatives Chart: http://www.dec.state.ny.us/website/dshm/redrecy/hhwcht.pdf
- Hazardous Products in the Home: Virtual Tour and Description: http://www.epa.gov/grtlakes/seahome/housewaste/house/mainmenu.htm
- Alternatives:[4]
    - **Adhesives** -- Use a water-based or latex adhesive.
    - **Batteries** -- Choose rechargeable batteries (removable, so they can be recycled) and mercury-free batteries when possible.
    - **Cleaners** -- Choose soap or detergent-based cleaners when possible. Avoid nonwater-soluable and corrosive cleaners when others offer an effective substitute.
    - **Household Pesticides** -- Look for ways to reduce your need for these products through appropriate cleaning and maintenance habits. Explore alternatives to chemical pest control. **URI CE GreenShare Program; URI CE Master Gardener Hotline 1 - 800 - 448-1011, Monday - Thursday 9am - 2 pm. http://www.uri.edu/ce/ceec/greenshare.html**
    - **Floor and Wood-finish strippers** -- Use a detergent or water-based stripper.
    - **Paint Stripper** -- Use sandpaper, a scraper, or heat gun for small jobs.
    - **Wood preservative** -- Use a water-sealing coating.

Read labels. Words such as corrosive, flammable, reactive, toxic, danger, poison, combustible, petroleum, benzene, carbon tetrachloride, chlorinated solvents, and mercury biocides are all indicators of a potentially harmful product. If possible, avoid them.

Buy the appropriate product for the task – ask a shopkeeper for help selecting.

Buy only the amount that you need and no more. New technology in paint matching has made stocking up on your favorite color unnecessary.

Heavy metals, acid and alkali leak into the environment from discarded batteries. To reduce their impact on the environment, there should be an overall reduction in the number of batteries discarded. Therefore, buy longer-life auto batteries and rechargeable button (AA, AAA, D…) batteries. This will help decrease pollution and save you money in the long run.

[4] These alternatives are as found at: http://www.uri.edu/ce/wq/has/html/has_hhw.html

Gasoline is also a household hazardous pollutant. To reduce the amount of gasoline released into the environment through atmospheric deposition and runoff[L], buy the most fuel-efficient vehicle that you can afford.

WHILE YOU HAVE IT…

Share with your neighbors.

Read and follow labels for use and storage.

For your car, truck, or boat:

Drive less, drive less, and drive less – use public transportation, carpool, walk, or bike.
Maintain your auto – a properly tuned vehicle emits less pollutants and last longer!
Fix any leaks.
To collect drips, use pans, cloths, and cat litter.
Collect used oil in jugs.

BEFORE YOU TOSS IT…

Correctly dispose of hazardous household products.

Paint:

Donate paint to theater and school groups and to community projects.

Reuse paint as a primer or on non-color sensitive surfaces like a storage area.

Solvents, such as paint thinners, can be reused – just allow to settle, then strain and save in a separate, marked container.

Recycle your old paint. New technology can reformulate unused paint into new paint. Call your town for collection options.

Cars, trucks, and boats:

At a place that sells used batteries, you can receive money for your old, used batteries.

Recycle used oil, which is used to make lubricants or is burned for power. Check with your town or with a local service station or mechanic.

Recycle used antifreeze (check with your town).

WHEN YOU TOSS IT…

DO NOT BURY, BURN, DUMP, OR POUR IN DRAINS OR ON THE GROUND.

Call your town's sanitation, public works, or environmental health department to find out about hazardous waste collection days and sites[M] - if one is not available REQUEST IT!

Read and follow labels for proper disposal.

Do not mix different chemicals with each other or other liquids. This may be very dangerous to you and will cause contamination, making it difficult to dispose.

AND FURTHERMORE…

- .Report polluting vehicles' license plate numbers by calling 1-800-EXHAUST (1-800-394-2878).
- Write a letter to your town/county in support of expanded hazardous waste collection and recycling.

[A] **Common Household (hazardous) Chemicals:**

Automotive

Motor oil
Gas
Antifreeze
Car batteries
Power steering fluid
Transmission fluid
Lubricating oils
Grease
Car polish
Car wax
Car (lead-acid) batteries

Electronics

Button batteries (AAA, D-cell, etc.)

Home improvement

Paints, both latex and oil-based
Furniture polish
Furniture wax
Cleaners
Paint strippers
Turpentine
Paint thinner
Mineral spirits

Heating

Kerosene

Personal grooming

Nail polish removers

[B] Stormwater Systems

Stormwater runoff can have a significant impact on water quality, causing harm to surface water and contributing to a failure to meet water quality standards. This occurs due to alteration of natural hydrologic patterns, accelerated stream flows, destruction of natural habitats, and elevation of pollutant loadings. Runoff may contain high levels of suspended solids, nutrients such as phosphorus and nitrogen, heavy metals, pathogens, toxins, floatables and organic materials. Rainfall causes these pollutants to be transported into nearby rivers, lakes, streams, estuaries, wetlands and oceans, where they can have a detrimental effect on water quality, compromise designated uses, and cause habitat alteration or destruction.

The 1998 National Water Quality Inventory, as required under section 305(b) of the Clean Water Act, (www.epa.gov, 1998) found that approximately 44% of the nation's assessed estuarine waters were impaired. Urban runoff and storm sewer discharges were identified as major sources of water quality impairment nationwide. Urbanization is a trend that continues to significantly reduce the infiltration capacity of the land while generating a variety of pollutants, leading to an increase in storm water runoff volume and pollutant loadings. The increase in impervious surface area that results from urban development causes storm water and snow-melt runoff to pick up pollutants along the way, while increasing in speed and volume. Resulting flows are higher in volume, pollutants and temperature than those in areas with lower percentages of impervious surface and more vegetation and soil to filter the runoff.

Additional stormwater pollution results from illicit discharges into the system, either via direct connections such as wastewater piping connected to storm drains, or indirect discharges such as infiltration from cracked sanitary systems, spills or dumping. The resulting untreated discharges contribute substances such as heavy metals, toxics, oil and grease, solvents, nutrients, viruses and bacteria to the pollutant load.

In the report entitled *Testing the Waters, A Guide to Water Quality at Vacation Beaches* (NRDC, 2001), The Natural Resources Defense Council indicates that of the major causes of beach closings in 2000, 85% were based on monitoring that detected bacteria levels exceeding beachwater-quality standards. Elevated bacteria levels can usually be traced to sewage or stormwater discharges, but it is difficult to identify the exact source of the problem. In Connecticut, the report cites stormwater pollution as a cause for 87% of the beach pollution closures.

The 1972 amendments to the Clean Water Act prohibit discharge of any pollutant from a point source without authorization by a NPDES permit (National Pollution Discharge Elimination System). The original control measures for point sources did not address storm water runoff, which was found to be a major source of water quality impairment, so in 1987 the CWA was amended to include a two phase program to address storm water discharges. Phase I required NPDES permits for stormwater discharges from priority sources such as medium and large municipal separate storm sewer systems (MS4's) (see definition below) serving populations of 100,000 or more and construction activity that disturbed five or more acres of land. Phase II will require permits for storm water discharges from certain small MS4's and for construction activity disturbing between 1 and 5 acres. This represents the next step in EPA's effort to preserve, protect and improve water quality by addressing polluted storm water runoff.

Definition: MS4 - Municipal separate storm sewer system - "a conveyance or system of conveyances (including

roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains). They may be owned by: State, city, town, borough, county, parish, district, association, other public body, including special districts or management agency; designed for collecting or conveying storm water; not a combined sewer; not part of POTW (publicly owned treatment works)." Storm Water Phase II Compliance Assistance Guide, U.S. EPA, Office of Water, EPA 833-R-00-002, March 2000.

[C] **Long Island Sound Watershed**

Estuaries

Long Island Sound is an estuary. An estuary is a tidal body of water that is fed by both salt and fresh water sources. Estuaries are partially sheltered water sources that are protected by land from harsh winds, and storms, that occur in oceans. Because of this protection, estuaries are perfect habitats for marine creatures in early stages of development. Estuaries are special because they act as transition habitats for marine animals moving from fresh water sources to ocean habitats. They also act as temporary homes or resting places for many creatures such as migratory birds and mammals, and as breeding grounds for many fish and other wildlife, and as permanent homes to shellfish and finfish. Tens of thousands of species can be found in an estuary. Many types of birds, fish, and mammals depend on estuaries for survival.

Estuaries are important because they are among the most productive systems on earth. Due to the unique water chemistry, many habitats are created. The mixture of salt and fresh water, tidal conditions, and shelter from harsh atmospheric conditions, create a unique and critical habitat for the survival of many marine species. Habitats are very diverse in estuaries ranging from less to concentrated saline areas, rocky shores to sandy beaches, mud flats to coral reefs, shallow harbors to deeper open waters, and regularly flushed areas to more stagnant enclosed areas.

Long Island Sound

Long Island Sound is bordered by New York and Connecticut. It is approximately 110 miles long and at its widest point reaches 21 miles. It is unusual in that it connected to the ocean at opposite ends: "the Race" at its eastern end, and the East River at its west end. (Most estuaries have only one connection to the ocean.) Long Island Sound's salt-water source is the Atlantic Ocean; its fresh water is from all of the rivers that drain to it, but the most significant fresh water sources are the Housatonic, Connecticut, and Thames Rivers.

Over 5,000,000,000 dollars is generated from activities related to Long Island Sound, including sport fishing, boating, swimming, and beach-going as well as commercial fishing. Long Island Sound's oyster fishery is one of the largest in the United States, generating 95% of the Nation's oysters.

Long Island Sound Watershed

Although Long Island Sound itself is 110 miles long, its watershed covers more than 16,000 square miles – an area the size of Delaware times eight. Long Island Sound's watershed covers all of Connecticut and parts of New York, Massachusetts, Rhode Island, Vermont, New Hampshire, and a small portion of Quebec, Canada. It

is estimated that 8,000,000 people live within Long Island Sound's watershed. Because of the large human population in the watershed, human impacts are high.

We all live in a watershed. Watersheds consist of a network of land and water that eventually join at one location, much like the branches of a tree come together at its trunk. Watersheds channel water from rain, snow, and ice and from underground sources to larger bodies of water. Watersheds are the land that water flows across as it makes its way to gutters, streams, bays, lakes, and rivers, and out to estuaries and eventually the ocean. In this process, nutrients are picked up and deposited into these bodies of water as well as on the land along the way. Watersheds can be small or large; the Long Island Sound watershed is large, but consists of a network of many smaller watersheds. Because watersheds are networks, changes to one watershed will affect others downstream.

Due to the significant human population in Long Island Sound's watershed, human-induced activities have a detrimental effect on water quality in the Sound. Humans have altered the land in the watershed, reduced open spaces, and have caused both point and non-point types of pollution in the watershed and in the Sound.

Point-source pollution is pollution from a specific source. It is the type of pollution that is discharged from a pipe from a factory, industrial site, or sewage treatment plant. It is the image most commonly associated with pollution. Although point-source pollution is an important issue concerning Long Island Sound and other water bodies, another type of pollution has an even greater negative effect – non-point source pollution.

Non-point source pollution, or "people pollution", cannot be associated with a distinct source but comes from many diffuse sources. It is a product of human activities, such as driving and washing automobiles and boats, maintaining lawns and gardens, constructing buildings and homes, altering the land, improper disposal of hazardous chemicals, and failing septic systems. These actions directly and indirectly affect the water quality of nearby waters that, in turn, will travel to the Sound. Because Long Island Sound's watershed is large and highly populated, the amount of non-point source pollution entering water bodies that drain into Long Island Sound is quite significant.

Non-point source pollution causes many of the same problems as point-source pollution, the only differences are that it is difficult to pinpoint its exact source and that it is far more difficult to prevent. Non-point source pollution adds extra nutrients, sediment, bacteria, toxins, and heavy metals to the Sound. This can stress and kill organisms and it adds to poor water quality resulting in such problems as hypoxia.

Why protect Long Island Sound?

Long Island Sound provides more than five billion dollars to the region's economy. People enjoy the recreational, economic, and aesthetic values of Long Island Sound, which are part of the region's culture. The Long Island Sound estuary not only provides recreational, economic, and aesthetic values, but it supports a wide variety of habitats. These habitats provide food and shelter for plants and animals as well as protect humans from the full force of storms. As more and more people choose to live and vacation in the region, human impacts to the Sound will also increase. It is critical that humans evaluate their activities at home and work to minimize their impact on the watershed and the Sound. The Sound is an important to the region's natural, recreational, and economic vitality; it is the region's greatest natural resource. It is our responsibility to protect and restore it so that it remains viable for future generations.

[D] Septic Systems:

The EPA reports that septic system failures are the most frequent sources of groundwater contamination. A properly functioning septic system filters out pollutants and disease-carrying microorganisms from wastewater, when a malfunction occurs these pollutants seep, untreated into groundwater, surface waters, nearshore areas, streams, and estuaries. This seepage results in a contaminated water supply and reduced water quality. Additionally, septic system overflows pose potential threats to humans through bacteria and viruses that cause hepatitis, dysentery, and other gastrointestinal infections. However, simple maintenance of your septic will reduce or eliminate such problems. "Remember: whatever is rinsed down the kitchen sink or flushed down the toilet ultimately makes its way into the soil and groundwater or remains in the septic tank until the tank is pumped."[D]

> ***Do not pour common household chemical down the kitchen sink or toilet and a*****void using strong detergents, solvents, and disinfectants. They can destroy the beneficial bacteria which are actively decomposing sewage and are essential for the septic system to function properly.**

FOR WAYS TO CARE FOR YOUR SEPTIC SYSTEM GO TO:
http://www.yoto98.noaa.gov/books/clncoast/clean7.htm

[E] Sewage Treatment Plants

In the past, the biochemical processes that take place in water bodies were relied upon to neutralize sewage. Aerobic, or oxygen-requiring, bacteria feed on the organic material in sewage, decomposing it. However, this process may use up the available oxygen that is dissolved in water. Frequently, the concentration of organic waste is so great that the biochemical oxygen demand (BOD) depletes the water's oxygen supply, killing fish and plants. The BOD measures of the amount of oxygen needed (in milligrams per liter or parts per million) by bacteria and other microorganisms to oxidize the organic matter present in a water sample over a period of 5 days. The BOD of drinking water should be less than 1, while raw sewage may run to several hundred.

Sewage treatment is classified as primary, secondary, or tertiary, depending on the degree to which the effluent is purified. All treatment facilities that discharge to waters of the United States must comply with the **secondary treatment** standards. **Primary treatment** is removal of floating and suspended solids. **Secondary treatment** uses biological methods such as digestion. **Tertiary treatment** removes all but a negligible portion of bacterial and organic matter.

Primary and secondary treatment together can remove up to 90% of the BOD. After undergoing chlorination to remove its bacterial component, the effluent from secondary sewage treatment is returned to the local surface water. This combination of primary and secondary treatment removes most of the organic matter in sewage and thus lowers the BOD. However, most of the **nitrogen** and **phosphorus** in sewage still remains in the effluent from secondary treatment. These inorganic nutrients can cause eutrophication of surface water receiving the effluent causing blooms of algae. To avoid this, a few communities add a third stage of treatment called **tertiary** or advanced waste treatment.

During this final process, the nearly purified water flows from the post-secondary sedimentation tanks into a large basin, where it is chlorinated to kill any remaining potential pathogens. This tertiary effluent then undergoes an aeration process to de-chlorinate the water as it flows down a series of steps prior to its final

discharge from the sewage treatment plant. Discharge water must be free of odors, suspended solids, and objectionable bacteria. (Coliform bacteria, which inhabit the lower intestines of mammals, while not pathogenic of themselves, are taken as an index of contamination of watercourses.)

[F] **LANDFILL**

A landfill is an engineered depression in the ground (or built on top of the ground) which stores items thrown out. The goal is to avoid any connection, particularly those water related such as streams and ground water, between the wastes and the surrounding environment. Landfills leach in two ways, through the bottom or over the top. "There are four critical elements in a secure landfill: a bottom liner, a leachate collection system, a cover, and the natural hydrogeologic setting. The natural setting can be selected to minimize the possibility of wastes escaping to groundwater beneath a landfill. The three other elements must be engineered. Each of these elements is critical to success."[F]

The Problems with Leachate Collection:[F]

They can clog up in less than a decade. HOW?

- from silt or mud;
- growth of microorganisms in the pipes
- chemical reaction leading to the precipitation of minerals in the pipes;
- the pipes become **weakened by chemical attack** (acids, solvents, oxidizing agents, or corrosion) and
- crushed by the tons of garbage piled on them

The Problems with Covers:

- Erosion by weathering;
- Vegetation roots that penetrate the cover;
- Burrowing animals
- Sunlight destroys membrane liners through ultraviolet radiation
- settling of wastes or organic decay of wastes, loss of liquids from landfilled drums can cause the cover, or portions of the cover to cave in;

FOR MORE INFORMATION
Diagram of a Landfill:
http://www.zerowasteamerica.org/LandfillDiagram.htm

[G] **Leachate**:

"Leachate is the liquid that is produced when rain falls on a landfill, sinks into the wastes, and picks up chemicals as it seeps downward."[G]
Texas A&M University compared leachate from municipal landfills with leachate from hazardous waste landfills and have found,"...There is ample evidence that the municipal waste landfill leachates contain toxic chemicals in sufficient concentration to be potentially as harmful as leachate from industrial waste landfills."

Dr. Kirk Brown and Dr. K.C. Donnelly at Texas A&M, authors of the new study, examined data on the composition of leachate from 58 landfills. The data they reviewed showed 113 different toxic chemicals in leachate from municipal landfills and 72 toxic chemicals in leachate from hazardous waste landfills. The abundance of toxics in municipal landfills probably occurs because the entire spectrum of consumer products ends up in municipal landfills, whereas hazardous waste landfills serve a limited number of industries within a region.

The *most likely source of most of the toxic materials* in municipal landfills is household products like paint solvents, oils, cleaning compounds, degreasing compounds, and pesticides. "In addition, the final depository of most of the products of our modern industrial society is the municipal waste landfill where the paints, plastics, and pharmaceuticals dissolve and degrade in the acidic anaerobic [oxygen-free] environment, thereby, releasing degradation products which may be even more toxic than the products from which they originated," say Brown and Donnelly.

For More Information

JOURNAL OF GROUND WATER*: "Application of Hydrogeology to the Selection of Refuse Disposal Sites,"* Ronald A. Landon, Vol. 7 (Nov.-Dec., 1969), pgs. 9-13

HAZARDOUS WASTES AND HAZARDOUS MATERIALS : *"An Estimation of the Risk Associated with the Organic Constituents of Hazardous and Municipal Waste Landfill Leachates,"* Dr. Kirk Brown and Dr. K.C. Donnelly, Vol. 5, No. 1 (Spring, 1988), pgs. 1-30.

Request a free reprint from Dr. Kirk Brown, Soil and Crop Sciences Department, Texas A&M University, College Station, TX 77843. Phone (409) 845-5201.

[H] Atmospheric deposition

"Atmospheric deposition of chemicals, such as sulfate and nitrate, can cause some surface water bodies to become acidic and may influence species survival and reproduction, especially in small headwaters catchments lacking significant inflow of neutralizing ground water. Also, ammonia volatilized from some agricultural activities can be deposited as nitrate in areas far from the origin, and may contribute to nutrient imbalances, water quality problems and long-term population changes in dominant plant species. Long distance transport of pesticide spray drift is also an emerging research topic. Overall, considerably more progress has been made in studies of "wet" deposition mechanisms versus that on the "dry" deposition of pollutants."[H]

For More Information:

Generally:

- http://nadp.sws.uiuc.edu/
- http://www.arl.noaa.gov/research/aq/sr/report.html
- http://btdqs.usgs.gov/acidrain/
- http://www.epa.gov/nep/airdep.htm

Atmospheric Deposition and Hypoxia:

- http://esa.sdsc.edu/hypoxrep.pdf

http://esa.sdsc.edu/pcairrpt.pdf

[I] Lead or Mercury Poisoning

Symptoms of Lead Poisoning

- "The general symptoms of lead poisoning are universal although more information is available on poisoning in humans. The first symptoms of lead toxicity are very general and nonspecific. These

include nausea, sluggishness, vomiting, painful gastrointestinal irritation, diarrhea, loss of appetite, colic, weakness and dehydration. These symptoms are common to many disorders and can often lead to inaccurate diagnosis.

- Some symptoms more specific to human poisoning include discoloration of the lips and skin attributed mild secondary anemia, a lead line on the gums, developmental disorders, sterility and abortion. There have also been some preliminary reports indicating that chronic lead poisoning can also lead to chronic nephritis and premature development of arteriosclerosis.

- More severe cases of poisoning can produce symptoms including convulsions, "wrist drop" or external limb paralysis, coma and ultimately death. "[I]

Symptoms of mercury Poisoning

"In the human body, mercury accumulates in the liver, kidney, brain, and blood. Mercury may cause acute or chronic health effects. Acute exposure (i.e., short term, high dose) is not as common today due to greater precautions and decreased handling. However, severe acute effects may include severe gastrointestinal damage, cardiovascular collapse, or kidney failure, all of which could be fatal. Inhalation of 1-3 mg/m3 for 2-5 hours may cause headaches, salivation, metallic taste in the mouth, chills, cough, fever, tremors, abdominal cramps, diarrhea, nausea, vomiting, tightness in the chest, difficulty breathing, fatigue, or lung irritation. Symptoms may be delayed in onset for a number of hours.

Chronic effects include central nervous system effects, kidney damage and birth defects. Genetic damage is also suspected.

Nervous system effects. These are the most critical effects of chronic mercury exposure from adult exposure as they are consistent and pronounced. some elemental mercury is dissolved in the blood and may be transported across the blood/brain barrier, oxidized and retained in brain tissue. Elimination from the brain is slow, resulting in nerve tissue accumulation. Symptoms of chronic mercury exposure on the nervous system include: Increased excitability, mental instability, tendency to weep, fine tremors of the hands and feet, and personality changes. The term "Mad as a Hatter" came from these symptoms which were a result of mercury exposure in workers manufacturing felt hats using a mercury-containing process.

Kidney effects: Kidney damage includes increased protein in the urine and may result in kidney failure at high dose exposure.

Birth defects: Neurologic damage from methyl mercury. The manifestations of mild exposure include delayed developmental milestones, altered muscle tone and tendon reflexes, and depressed intelligence.

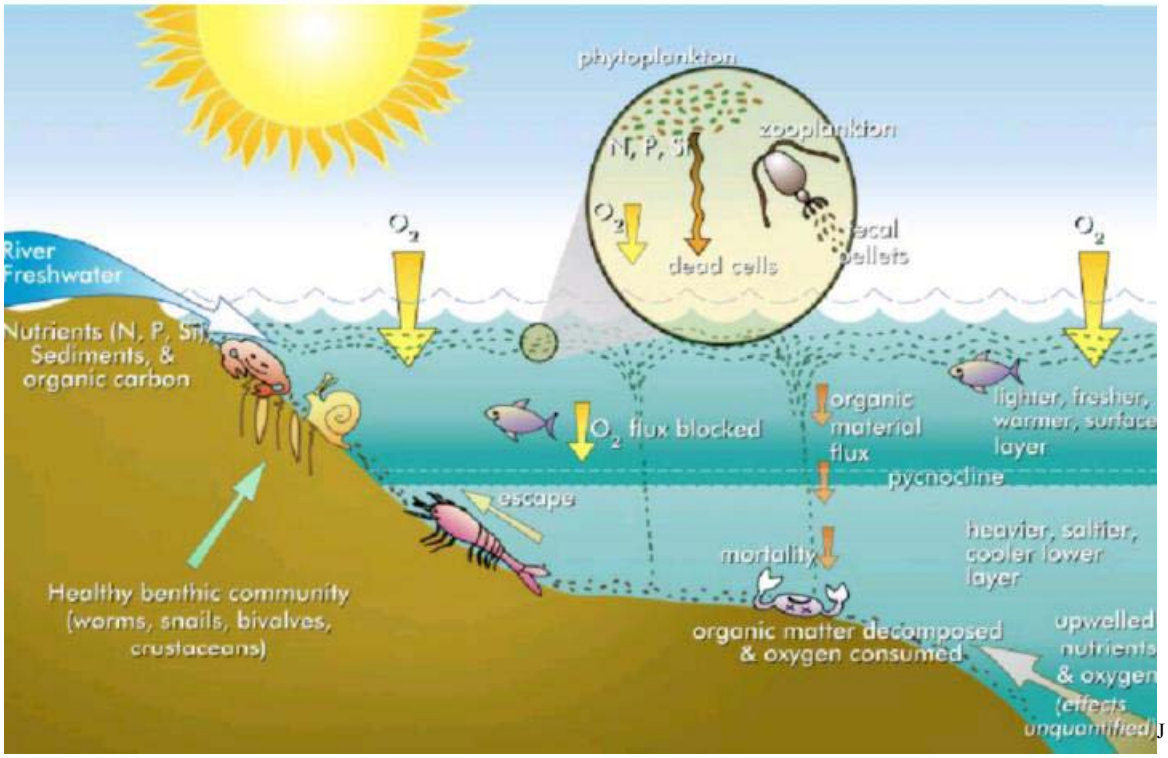
Mercury exposure in children can cause a severe form of poisoning termed acrodynia. Acrodynia is evidenced by pain in the extremities, pinkness and peeling of the hands, feet and nose, irritability, sweating, rapid heartbeat and loss of mobility."[I]

[I] http://www.orcbs.msu.edu/AWARE/pamphlets/hazwaste/mercuryfacts.html Ingham County Emergency Planning & Community Right-to-Know Committee, Michigan State University Office of Radiation, Chemical & Biological Safety

[J] **HYPOXIA**

"Hypoxia means an absence of oxygen reaching living tissues. In coastal waters, it is characterized by low levels of dissolved oxygen, so that not enough oxygen is available to support fish and other aquatic species. Nutrients, such as nitrogen and phosphorous, are essential for healthy marine and freshwater environments. However, an over overabundance of nutrients can trigger excessive algal growth or eutrophication."[J]

The algae plants eventually die, sink to the bottom, and use up oxygen during their decomposition. While the surface layer of Long Island Sound stays oxygenated through contact with the atmosphere and photosynthesis, the oxygen cannot penetrate down into deeper water due to a barrier, which prevents the mixing of surface and bottom waters, known as a pycnocline (a separation between two layers of different densities). The respiration of bottom dwelling animals combined with the oxygen depleting process of decomposition uses up oxygen at a rate faster than can be replenished. This creates a deficiency in the amount of oxygen that reaches the tissues of bottom dwelling animals. The name for this condition is Hypoxia. In Long Island Sound, hypoxia has been connected to: the reduction in the number and variety of adult finfish, reduction in the growth rate of juvenile lobsters and winter flounder, and desolation of slow moving species (lobster, starfish, bay anchovy, menhaden, cunner, tautog, and sea robin). As a result, the portion of the local economy that depends upon the harvest of these species suffers.



[J]

United States Environmental Protection Agency: Mississippi River Basin Challenges- http://www.epa.gov/msbasin/hypoxia.htm

Barrett Outdoor Communications

Save the Sound

[K] Algae

Algae is a plant that can range from a small single-celled form to more intricate multi-cellular forms. They are photosynthetic organisms and exist in a wide variety of habitats. While most people associate this organism with water, algae can also occupy desert sands. Fossil records have dated it back approximately 3 billion years.

The importance of algae is multi-layered. It provides oxygen for other aquatic life forms, is the chief creator of organic matter for the lower members of the food chain and can contribute to the human economy directly as a source of food, medicine and other products. When an algal bloom occurs (due to excess nutrients), algae contribute to mass mortality of other marine organisms.

[L] POLLUTED RUNOFF

Polluted runoff contains various components that can degrade water quality. Runoff may contain high levels of suspended solids, nutrients such as phosphorus and nitrogen, heavy metals, pathogens, toxins, pesticides, floatables and organic materials. Rainfall causes these pollutants to be transported into nearby rivers, lakes, streams, estuaries, wetlands and oceans, where they can have a detrimental effect on water quality, compromise designated uses, and cause habitat alteration or destruction.

Landscaping practices are a potential source of pollutants in urban runoff, with fertilizers from use at home and on golf courses, cemeteries and public parks adding nutrients to runoff. Lawn care chemicals have been directly linked to urban water quality, where large amounts of pesticides and herbicides may be found in stormwater.

[M] HOUSEHOLD HAZARDOUS WASTE DISPOSAL

Keep in mind that what "goes on the ground, goes in the Sound." What goes in your trash can be harmful too! When you get ready to discard all of those harmful, toxic household substances, don't just throw them in the trash can or dump them down the drain, check your local hazardous drop off dates so that disposal is done in a proper fashion.

The following hazardous household waste facilities were provided by www.earth911.org:

Fairfield County:

SHELTON, CT 06484
Phone: (203) 381-9571
Days/Hours: Please call for current HHW collection and event information.
Location Notes: This program offers one day collection events. Please call for a complete list of materials accepted. This program is open to the residents of Darien, Easton, Greenwich, Monroe, New Canaan, Norwalk, Shelton, Stamford, Stratford, Trumbull, Weston, Westport, and Wilton.
Materials Collected / Services Offered:
Used Motor Oil, Used Oil Filters, Antifreeze, Car Batteries, Transmission Fluid, Brake Fluid, Paint Disposal, Pesticides, Insecticides, Herbicides, Fungicides, Fertilizers, Household Cleaners, Solvents, Degreasers, Adhesives, Gasoline and Unwanted Fuels, Pool Chemicals, Photographic Chemicals, Paint Thinners, Items Containing Mercury
Web Link: http:// dep.state.ct.us/wst/recycle/hhwsched.htm

Hartford County:

HARTFORD, CT 06120
Phone: (860) 278-3809
Days/Hours: Please call for current HHW collection and event information.
Location Notes: The HHW events usually occur May to October. Please call for a complete list of materials accepted. This program is open to the residents of Avon, Bloomfield, Canton, East Granby, East Hartford, East Windsor, Enfield, Farmington, Granby, Hartford, Newington, Rocky Hill, Simsbury, South Windsor, West Hartford, Wethersfield, Windsor, and Windsor Locks.
Materials Collected / Services Offered:
Antifreeze, Rechargeable batteries (non-NiCd), Transmission Fluid, Brake Fluid, Fluorescent Light Bulb Disposal, Aerosol Cans, NiCd Batteries, Paint Disposal, Propane Tanks, Pesticides, Insecticides, Herbicides, Fungicides, Fertilizers, Household Cleaners, Solvents, Degreasers, Adhesives, Gasoline and Unwanted Fuels, Pool Chemicals, Photographic Chemicals, Paint Thinners, Items Containing Mercury, Asbestos
Web Link: http:// dep.state.ct.us/wst/recycle/hhwsched.htm

MANCHESTER
322 Olcott Street
MANCHESTER, CT 06040
Phone: (860) 278-3809
Days/Hours: Please call for current household hazardous waste information.
Distance: 15.64 mile(s)
Location Notes: This site accepts muriatic acid, chemical paint strippers, no pest strips, chemistry kits, poisons, flea powder, spray and dip, polishes, fungicides, pool chemicals, hair dye and spray, rodent killers, hearing aid batteries, slug baits, oil based stains, kerosene, lead paint, wood preservatives, and lead paint chips (double bag if wet). Please leave all materials in original containers. This program is open to the residents of Glastonbury, Hebron, Manchester, Marlborough, Somers, Stafford, and Vernon.
Materials Collected / Services Offered:
Transmission Fluid, Brake Fluid, NiCd Batteries, Paint Disposal, Pesticides, Insecticides, Herbicides, Fungicides, Fertilizers, Household Cleaners, Solvents, Degreasers, Adhesives, Gasoline and Unwanted Fuels, Pool Chemicals, Photographic Chemicals, Paint Thinners, Asbestos.
Web Link: http:// dep.state.ct.us/wst/recycle/hhwsched.htm

MANCHESTER, CT 06040
Phone: (860) 647-3067
Days/Hours: Please call for more specific information on household hazardous waste disposal.
Distance: 17.5 mile(s)
Location Notes: This site is located at Somers School Project on Vision Drive in Somers. This program is open to households from the Towns of Glastonbury, Hebron, Manchester, Marlborough, Somers, Stafford, and Vernon.
Materials Collected / Services Offered:
Used Motor Oil, Used Oil Filters, Antifreeze, Car Batteries, Single-use Batteries, Transmission Fluid, Brake Fluid, Paint Disposal, Pesticides, Insecticides, Herbicides, Fungicides, Fertilizers, Household Cleaners, Solvents, Degreasers, Adhesives, Gasoline and Unwanted Fuels, Pool Chemicals, Photographic Chemicals, Paint Thinners, Items Containing Mercury
Web Link: http:// dep.state.ct.us/wst/recycle/hhwsched.htm

Litchfield County:

LITCHFIELD, CT 06759
Phone: (860) 491-9884
Days/Hours: Please call for current household hazardous waste collection information.
Materials Collected / Services Offered:

Used Motor Oil, Used Oil Filters, Antifreeze, Car Batteries, Single-use Batteries, Transmission Fluid, Brake Fluid, Paint Disposal, Pesticides, Insecticides, Herbicides, Fungicides, Fertilizers, Household Cleaners, Solvents, Degreasers, Adhesives, Gasoline and Unwanted Fuels, Pool Chemicals, Photographic Chemicals, Paint Thinners, Items Containing Mercury

Middlesex County:

MIDDLETOWN, CT 06457
Phone: (860) 278-3809
Days/Hours: Please call for current HHW collection and event information.
Location Notes: The HHW events usually occur May to October. Please call for a complete list of materials accepted. This program is open to the residents of Cromwell, Durham, East Hampton, Haddam, Middlefield, Middletown, and Portland.
Materials Collected / Services Offered:
Antifreeze, Rechargeable batteries (non-NiCd), Transmission Fluid, Brake Fluid, Fluorescent Light Bulb Disposal, Aerosol Cans, NiCd Batteries, Paint Disposal, Propane Tanks, Pesticides, Insecticides, Herbicides, Fungicides, Fertilizers, Household Cleaners, Solvents, Degreasers, Adhesives, Gasoline and Unwanted Fuels, Pool Chemicals, Photographic Chemicals, Paint Thinners, Items Containing Mercury, Asbestos
Web Link: http:// dep.state.ct.us/wst/recycle/hhwsched.htm

New Haven County:

90 Sargent Drive
NEW HAVEN, CT 06511
Phone: (203) 401-2712
Days/Hours: This site is open May to October on Saturday mornings from 9am to noon.
Location Notes: This site accepts waste from households only. The towns of Bethany, Branford, Cheshire, East Haven, Fairfield, Guilford, Hamden, Madison, North Branford, Milford, New Haven, North Haven, Orange, West Haven, Wallingford, and Woodbridge may use this site.
Materials Collected / Services Offered:
Used Motor Oil, Used Oil Filters, Antifreeze, Car Batteries, Single-use Batteries, Transmission Fluid, Brake Fluid, Paint Disposal, Pesticides, Insecticides, Herbicides, Fungicides, Fertilizers, Household Cleaners, Solvents, Degreasers, Adhesives, Gasoline and Unwanted Fuels, Pool Chemicals, Photographic Chemicals, Paint Thinners, Items Containing Mercury
Web Link: http:// dep.state.ct.us/wst/recycle/hhwsched.htm

ANSONIA, CT 06401
Phone: (860) 278-3809
Days/Hours: Please call for current HHW collection and event information.
Location Notes: The HHW events usually occur May to October. Please call for a complete list of items accepted. This program is open to the residents of Ansonia, Derby, and Seymour.
Materials Collected / Services Offered:
Antifreeze, Rechargeable batteries (non-NiCd), Transmission Fluid, Brake Fluid, Fluorescent Light Bulb Disposal, Aerosol Cans, NiCd Batteries, Paint Disposal, Propane Tanks, Pesticides, Insecticides, Herbicides, Fungicides, Fertilizers, Household Cleaners, Solvents, Degreasers, Adhesives, Gasoline and Unwanted Fuels, Pool Chemicals, Photographic Chemicals, Paint Thinners, Items Containing Mercury, Asbestos
Web Link: http:// dep.state.ct.us/wst/recycle/hhwsched.htm

New London County:

1000 Hartford Road
LEBANON, CT 06249

Phone: (860) 444-5864
Days/Hours: Please call for current HHW collection and event information.
Distance: 7.4 mile(s)
Materials Collected / Services Offered:
Paint Disposal, Pesticides, Insecticides, Herbicides, Fungicides, Fertilizers, Household Cleaners, Solvents, Degreasers, Adhesives, Gasoline and Unwanted Fuels

Tolland County:

Hancock Road
WILLINGTON, CT 06279
Phone: (860) 684-3163
Days/Hours: Please call for current HHW collection and event information, events usually last from 9am to 2pm.
Location Notes: This site is located on Hancock off of Ruby Road. This program accepts drain cleaners, metal polish, dry cleaning fluids, art and craft supplies, oven cleaners, and other chemicals. Please call for a complete list. This site requires batteries be packed in original containers if possible, sealed, labeled, and limited to one hundred pounds. No mixed materials or business wastes are accepted. This program is open to residents from the following towns: Andover, Ashford, Bolton, Chaplin, Columbia, Coventry, Eastford, Mansfield, Tolland, Union, Willington, and Windham.
Materials Collected / Services Offered:
Single-use Batteries, Transmission Fluid, Fluorescent Light Bulb Disposal, Aerosol Cans, Paint Disposal, Pesticides, Insecticides, Herbicides, Fungicides, Fertilizers, Household Cleaners, Solvents, Degreasers, Adhesives, Gasoline and Unwanted Fuels, Pool Chemicals, Photographic Chemicals, Paint Thinners
Web Link: http:// dep.state.ct.us/wst/recycle/hhwsched.htm

Vision Drive
SOMERS, CT 06071
Phone: (860) 647-3067
Days/Hours: Please call for more specific information on household hazardous waste disposal.
Location Notes: This site is located at Somers School Project in Somers. This program is open to households from the Towns of Glastonbury, Hebron, Manchester, Marlborough, Somers, Stafford, and Vernon.
Materials Collected / Services Offered:
Used Motor Oil, Used Oil Filters, Antifreeze, Car Batteries, Single-use Batteries, Transmission Fluid, Brake Fluid, Paint Disposal, Pesticides, Insecticides, Herbicides, Fungicides, Fertilizers, Household Cleaners, Solvents, Degreasers, Adhesives, Gasoline and Unwanted Fuels, Pool Chemicals, Photographic Chemicals, Paint Thinners, Items Containing Mercury
Web Link: http:// dep.state.ct.us/wst/recycle/hhwsched.htm

Windham County:

WINDHAM, CT 06280
Phone: (860) 684-3163
Days/Hours: Please call for current HHW collection and event information, events usually last from 9am to 2pm.
Location Notes: This site is located on Hancock off of Ruby Road in Willington. This program accepts drain cleaners, metal polish, dry cleaning fluids, art and craft supplies, oven cleaners, and other chemicals. Please call for a complete list. This site requires batteries be packed in original containers if possible, sealed, labeled, and limited to one hundred pounds. No mixed materials or business wastes are accepted. This program is open to residents from the following towns: Andover, Ashford, Bolton, Chaplin, Columbia, Coventry, Eastford, Mansfield, Tolland, Union, Willington, and Windham.
Materials Collected / Services Offered:

Single-use Batteries, Transmission Fluid, Paint Disposal, Pesticides, Insecticides, Herbicides, Fungicides, Fertilizers, Household Cleaners, Solvents, Degreasers, Adhesives, Gasoline and Unwanted Fuels, Pool Chemicals, Photographic Chemicals, Paint Thinners, Items Containing Mercury
Web Link: http:// dep.state.ct.us/wst/recycle/hhwsched.htm

For more information:
Disposal Generally- http://www.earth911.org
Disposal of hazardous wastes- http://www.epa.gov/epaoswer/osw/hazwaste.htm