

# To Make the Waters Run Clear

---

*When the waters again run clear and their life is restored, we might see ourselves reflected whole.*

- Dr. David Orr

A family in Portland, Oregon, has added one foot of rich black compost to its lawn that was made in its compost pile over a 15-year period of time.

Dr. Ole Ersson and his wife, Maitri, recently sold that home and moved into a small cottage that is also in Portland, which means they'll be starting over, building new soil.



Photo EPA

"We kind of regret leaving that place," said Dr. Ersson. "The fertility is astounding. It is such healthy soil. It's rich black earth full of humus. Very fertile. Very friable. You can almost just dig your hand into it, it is so soft."

They not only compost their vegetable and fruit peelings and leaves, they also compost their humanure, which they collect in what they call a "sawdust toilet." It is a five gallon bucket with a removable toilet seat that fits down over it.

"As you know, nature doesn't have waste. Nature recycles everything.

Somebody poops in the forest and it decays and creates fertility and new soil. We have perverted that and invented waste; not just waste, but waste on just a humongous scale."

Every week or so, they add several buckets of humanure to their compost pile, well covered with sawdust. "In about six months, it smells like fresh earth," said Dr. Ersson.

Their urine, which is collected separately, is diluted one part to five with water and poured directly on their plants. "If you put it on full strength, it can be a little bit too strong. It's high in nitrogen and has salt in it too," he said.

The Stockholm Environment Institute says human urine leaves the body sterile, is a well-balanced complete fertilizer resembling very much the commercial fertilizers NPK and that its nutrients are readily available to plants.

### **The Cycles of Nature**

Humus, pronounced "hue mus," is a dark, moist, nutrient-rich material formed from decayed plant and animal residues, such as excreta, dead bugs, grass clippings, fallen leaves, dead plants and twigs etc.

Humus helps create living soil by fostering a complex ecosystem teeming with microorganisms and fungi. This inhibits plant diseases by consuming or crowding out plant pathogens.

The microorganisms and fungi in the humus/compost are at work all throughout the growing season to break down organic matter, which enriches the soil with nutrients such as iron, copper, zinc, manganese and boron.

This pleasant, earth smelling material, which you have probably seen on the forest floor under a rotting log, is spongy and porous, and thus helps keep soil loose, full of oxygen and well drained.

Humus also has substances in it that act as a soil glue, holding soil particles together, which gives it water-holding capacity. This helps the soil stay moist when there is a drought and helps prevent soil erosion.

The institute is an active member of EcoSanRes, a network of organizations managed by the Swedish Environment Institute that is promoting a variety of less "environmentally abusive" alternatives to sanitation.

"The issue of sanitation is very often neglected, you know. It's embarrassing to a lot of people, but it must be discussed for the protection of human health, the environment and ecosystems," said Cecilia Ruben, a program development manager with the Stockholm Environment Institute.

"At one point, a high level government person realized that this is really an issue to focus on and Sweden, along with a few other governments are taking it seriously: Germany, the Netherlands, Norway, Denmark, Switzerland, Austria, Finland and others. You find examples of ecological sanitation in these countries."

### **Composting Humanure in Ancient Times**

Composting humanure for use in agriculture began in China during the 12<sup>th</sup> Century or before. The idea spread to Japan, probably when Zen Buddhists traveled to China to study.

Japanese farmers were greatly impressed with the gains in productivity when they used humanure as a fertilizer. They began paying people for their excreta, keeping the urban areas clean and disease free.

The Chinese composted humanure along with animal waste, grass clippings,

soil brought into the village and huge amounts of mud from the irrigation canals, which was rich in organic matter from the snails and other aquatic biota that lived in the water. Using this organic matter, they were able to maintain the fertility of the soil for 3,000 years in spite of the intense usage of the land due to severe population pressures.

In contrast, the United States has "exhausted strong virgin fields" in three generations, wrote F.H. King, who was a professor of agricultural physics and chief of the division of soil management with the U.S. Department of Agriculture and who visited these countries in the mid 1920s and wrote a classic book called Farmers of Forty Centuries: Or Permanent Agriculture in China, Korea and Japan.

### **The Flush-Toilet Fallout**

By using flush toilets, we not only deprive the land of nutrients, a growing number of scientists are proving that we also endanger aquatic ecosystems. For instance, scientists at Brunel University in the UK have been researching the impact of artificial estrogens excreted in urine that is discharged into water bodies by sewage treatment plants. "We discovered that not only can you detect these in effluent and river water, but that they are present in high enough concentrations to cause effects on fish," said John Sumpter, an ecotoxicologist at Brunel University. "Our fish get feminized basically."

After examining thousands of wild fish in eight rivers, he and his colleagues found that "100 percent of male fish [examined] were feminized in quite a few locations on some rivers."

The problem is not limited to the UK. "We have very good evidence from across the whole world now that estrogens in effluent are feminizing wild fish," he said.

Researchers with the U.S. Geological Survey discovered intersex among male bass in the Potomac River in West Virginia when they were called in to investigate the cause of fish kills and fish with lesions, open sores and places where the skin was missing. In some areas of the South Branch of the Potomac River in West Virginia, they found as many as 80 percent of the male fish were intersex.

"I believe that it's all tied together because many of these endocrine disrupting hormones also affect disease resistance," said Vicky Blazer, a pathologist with the U.S. Geological Survey. "The endocrine system and immune system are closely tied."

According to the UK environment agency, artificial estrogens in birth control pills are so potent, that fish can be affected by concentrations less than one

nanogram per liter, which is "equivalent to finding one person in the population of the world." The agency also said "male fish with more than moderate changes in their sexual organs are less able to reproduce, with potentially serious implication for fish populations."



Air and water move through us like a river of life, what we do to it, we do to ourselves.

- Dr. David Suzuki

Scientists are trying to determine if there might be a link between estrogens in tap water, the early onset of puberty in girls and a decrease in the sperm counts of males. Sperm counts of males have decreased over the past generation or so, not to the point to where it is causing infertility, but scientists say if that trend continues, we could get to the point where there are some fertility issues.

Consumption of artificial estrogens is intensified on rivers where water is recycled again and again before it reaches the sea. Consider the vast amount of times water is recycled on the Potomac River and its tributaries on the Mid Atlantic Coast of the United States. Water is taken up by a community then flushed down toilets, sinks and tubs. Twenty miles downstream the water is taken

up by another community then flushed down toilets, sinks and tubs and so on 129 times since there are 129 sewage treatment plants on the river and its tributaries.

Dr. Sumpter said, "[in England] there are a lot of locations where effluent is 50 percent of the flow. And we have some locations where effluent is 90 percent of the flow."



Susan Middleton © California Academy of Sciences

There is "quite a bit of information" to suggest that permanent, 24 hour exposure to low concentrations of chemicals is of concern.

- Dr. John Sumpter

Dr. Jean Ginsburg, who was a fertility specialist at the Royal Free Hospital in

London, found that men consuming such water from the Thames, where water is reused seven times, were less fertile and had poorer-quality sperm than men in other areas.

### **A Witch's Brew of Chemicals**

Another scientist concerned about the impact of sewage treatment plants is Dana Kolpin, a research hydrologist with the US Geological Survey in Iowa. Kolpin has been testing U.S. streams for the presence of pharmaceuticals, including heart medications, anti-depressants, headache remedies, artificial estrogens, antibiotics and many more.

He also tests for chemicals in antibacterial soaps, shampoos, detergents, insecticides and other chemicals dumped into water ways by sewage treatment plants. In their last study, they tested for 150 chemicals and sometimes found as many as 50.

Asked if he would find more substances if he tested for more, Kolpin said, "Without question. Even with the pharmaceuticals, we are just scratching the surface. ... There are thousands of compounds out there we could measure, but that would be insurmountable. It is just impossible to measure 10,000 compounds."

Kolpin said waste water treatment plants "were never designed to remove chemical compounds. That wasn't part of their objectives," he said, adding, "They're basically to remove pathogens and to a certain extent, nutrients."

He expressed concern about people pouring paint down the drain. "That would tend to overwhelm any wastewater treatment plant," he said. He and his

### **It's Not Just Sewage Treatment Plants Polluting Water Bodies**

Water bodies not only receive chemicals from sewage treatment plants, they also receive toxic vehicle exhaust from the air, as well as exhaust and motor oil laced with radioactive particles that washes off roads when it rains. It flows into culverts that empty into streams that empty into rivers.

Also significant, the Potomac River, which is on the Mid Atlantic Coast of the United States, has 1,213 pipes from businesses discharging pollutants into the 41 watersheds of the river, according to the Maryland Department of the Environment. The Potomac river provides tap water for five million people.

colleagues are trying to find out if such compounds "are pervasive in our drinking water."

Sumpter expressed concern about what mixtures of chemicals do to wildlife. "The simple answer is that nobody knows. ... You can show that when a number of chemicals are present in a mixture, the response of the fish is greater than the response to any individual chemical."

Also there is "quite a bit of information" to suggest that permanent, 24 hour exposure to low concentrations of chemicals is of concern, he said.

### Flush Toilets and Nutrients

Another serious problem with conventional sewage systems is that the final effluent they dump into streams over-enriches rivers, causing a profuse growth of algal blooms. As these blooms die, microorganisms that decay them use up oxygen in the water.

The Chesapeake Bay receives nutrient-rich effluent from the toilets, showers, sinks and washing machines of 16 million people -- around 1.5

billion gallons every day from close to 500 sewage treatment plants situated on the

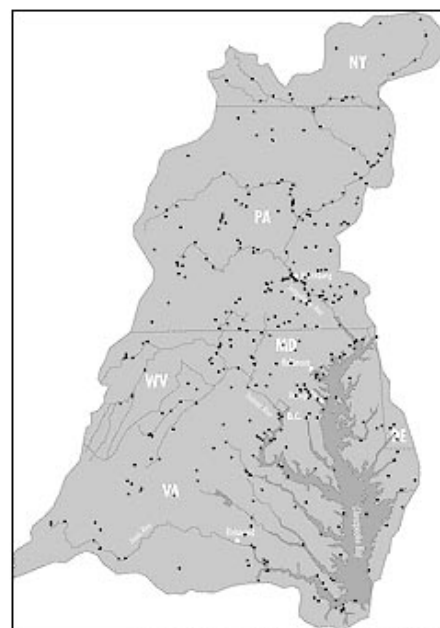


Photo Chesapeake Bay Foundation

The Chesapeake Bay watershed with water treatment facilities noted as black dots.

48 major rivers and hundreds of smaller creeks, streams and rivers that empty into the Chesapeake from parts of New York, Maryland, New Jersey, Pennsylvania, Delaware, Virginia and West Virginia.

The Bay also receives nutrients from fertilizer run off from farm fields, atmospheric deposition of exhaust from fossil fuels and runoff from large-scale chicken, hog, cattle and turkey farms that generate 88 billion pounds of manure a year.

#### **Human Overuse of Water**

Of the world's 500 major rivers, 250 are seriously polluted and depleted from overuse, according to the United Nation's Educational, Scientific and Cultural Organization's World Commission on Water for the 21<sup>st</sup> Century.

Furthermore, when it rains, antiquated sewer systems dump raw sewage into rivers that make their way into the Bay.

As a result, 36 percent of the Chesapeake Bay was anoxic during the summer of 2006 creating a dead zone 100 miles wide.

"Worldwide, there are some 146 dead zones," wrote Janet Larson with the Earth Policy Institute, adding that the dead zone in the Gulf of Mexico is "larger than the state of New Jersey."

In places where oxygen is low in the Cheapeake Bay, crabs scrambled to the beaches just to breath, watermen pulled up crab pots full of dead crabs and the bloated bodies of dead fish washed up on the shores.

The nutrient-enriched water causes an explosive growth of tiny plants and

animals that coat the leaves of the seagrasses. This film kills vegetation by preventing photosynthesis by keeping the sunlight from penetrating the leaves.

The nutrient-enriched water also contributes to a decline in seagrasses by causing a growth of algae that

prevents the light from penetrating the water. The loss of seagrasses means a loss of food and/or safe places to hide for numerous species.

### **Fouling Up**

To Hindus, the Ganges River is a sacred goddess. Millions of pilgrims dressed in loincloths and saris come to the river to recite prayers and take a holy dip - - even as raw sewage pours into the water from 30 sources.

### **Depletion of Rivers**

Another problem with conventional sewage systems is the enormous amount of fresh water it takes to flush away wastes -- about 50,000 gallons per year for the average household, according to Dr. Sim Van der Ryn, an emeritus professor of architecture at the University of California, Berkeley.

To keep from stressing aquatic ecosystems with such massive withdrawals of fresh water, the EcoSanRes program not only recommends ecological sanitation with dry collection of solids, but also rainwater harvesting using cisterns and rain barrels to provide water for hygiene and agriculture.

To prevent chemical contamination of waterbodies, EcoSanRes recommends

the use of wetlands to treat greywater from showers, washing machines and sinks.

With the use of appropriate technologies, the waters can again run clear as the earth ever increases in richness and aesthetic beauty.