

# Land application of sewage sludge: Risks and recommendations



**Blue Ridge Environmental Defense League  
NC Healthy Communities  
[WWW.BREDL.ORG](http://WWW.BREDL.ORG)**



**- 1988 -**

**Ocean dumping of sewage sludge banned.**

*1991 WEF Name Change Task Force*

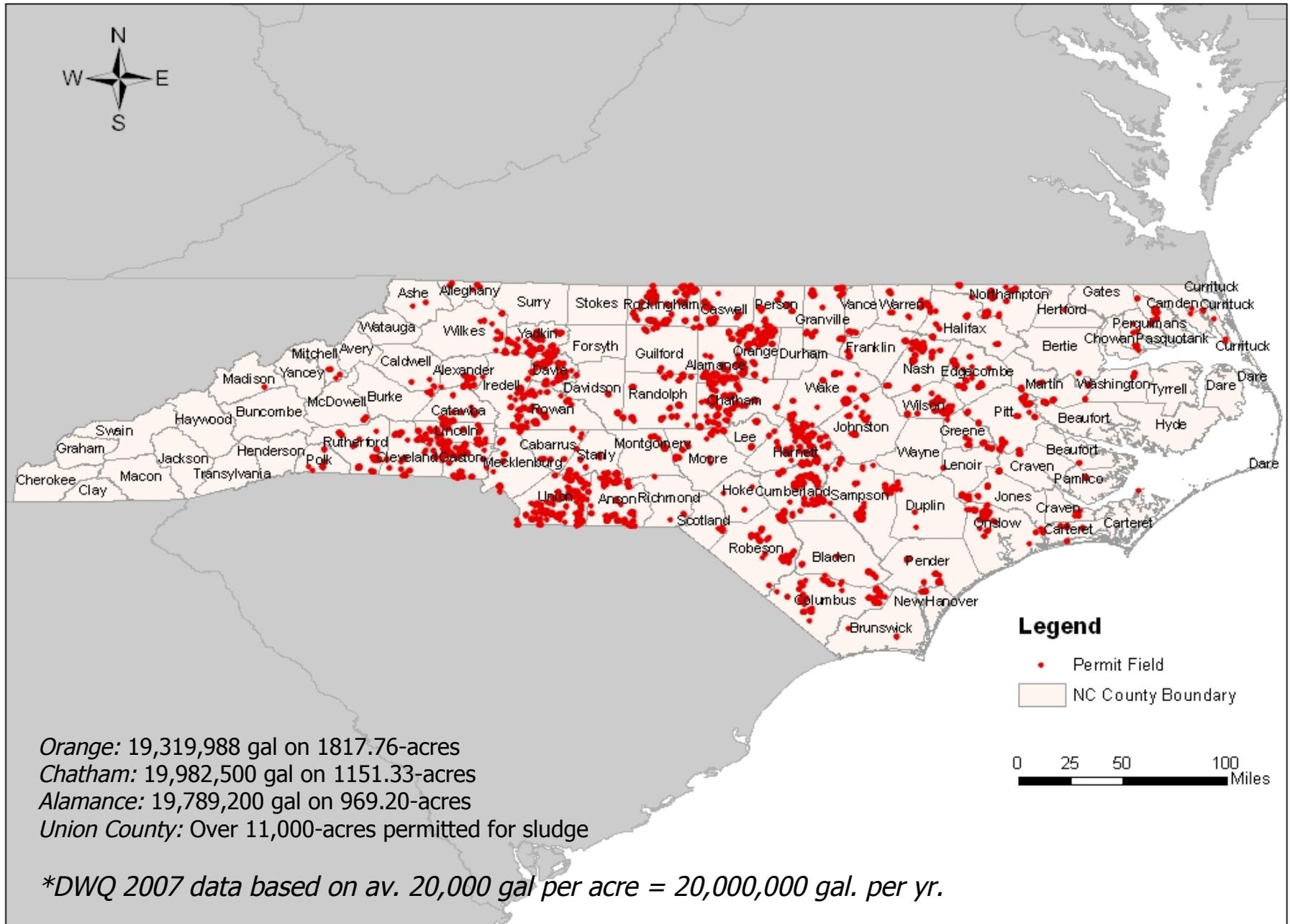
*Over 250 entrees:*

"All growth," "purenutri," "biolife," "bioslurp," "black gold," "geoslime," "sca-doo," "the end product," "humanure," "hu-doo," "organic residuals," "bioresidue," "urban biomass," "powergro," "organite," "recyclite," "nutri-cake" and "ROSE," short for "recycling of solids environmentally."

**The winning name:  
BIOSOLIDS!**



## NC Permitted Sewage Sludge Land Application Fields



# What is sludge?

“Residual, semi-solid material left from industrial wastewater or sewage treatment processes.”

“Anything that is dumped into a sewer that is removed from water by the treatment process becomes sludge.”

“Includes landfill leachate and runoff from farmlands, industry and development.”

“Pretty much anything that humans living and working in a town or city flush down their toilets or pour down their drains.”

“Inevitably a noxious brew of vastly various and incompatible materials unpredictable in themselves and in the toxicity of their amalgamation, incalculably but certainly wildly dangerous to life.”

“Growing and continuous mountain of hazardous waste produced daily by wastewater treatment plants.”



## Growing opposition.



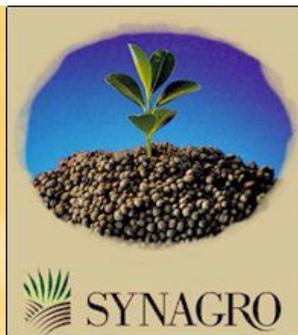
**In 2003, a coalition of 73 labor, environment, and farm groups formally petitioned EPA for a moratorium on the land application of sewage sludge. Signatories include the United Mine Workers of America, Clean Water Action, the Organic Consumers Association, the Center for Food Safety, Farm Aid, and Citizens for a Future New Hampshire.**

**The National Farmers Union opposes sludge spreading on agricultural land**

**National organic standards prohibit use of sludge in organically-grown food products**

**Institute for Agriculture and Trade Policy (IATP): "Smart Guide on Sludge Use in Food Production" (2008)**

**At least 8 major food companies prohibit purchase of produce grown on land "fertilized" with sludge because of potential liabilities.**



**“Naturally Superior”**

**“Safe, nutrient-rich organic material”**

**“Maintains land’s long-term productivity”**

**“Rich in nitrogen and phosphorus, and contains micronutrients such as sulfur, magnesium, calcium, copper, zinc, and some potassium.”**

**“Almost half of all biosolids produced are being recycled, and everyone knows that recycling benefits the environment.”**

**“Pretreatment requires that industrial plants treat or remove any contaminants from their wastewater before it is discharged to a WWTP.”**

**“Specifically-mandated treatments minimize any potential odors.”**

**“Biosolids must meet strict quality criteria and regulations set by the USEPA ... based on EPA’s rigorous review of decades of long-term scientific studies regarding the safety and efficacy of biosolids recycling.”**

# **Treatment and testing consists of:**

**Lime stabilization and aerobic digestion to “disinfect” sludge by reducing organic matter, pathogen content, offensive odors**

**Testing required for 9 metals, nutrients, total coliform once per week or less depending on volumes produced**

**Other methods of getting rid of sludge: incineration, land filling, pelletizing, composting using “Class A” sludge**

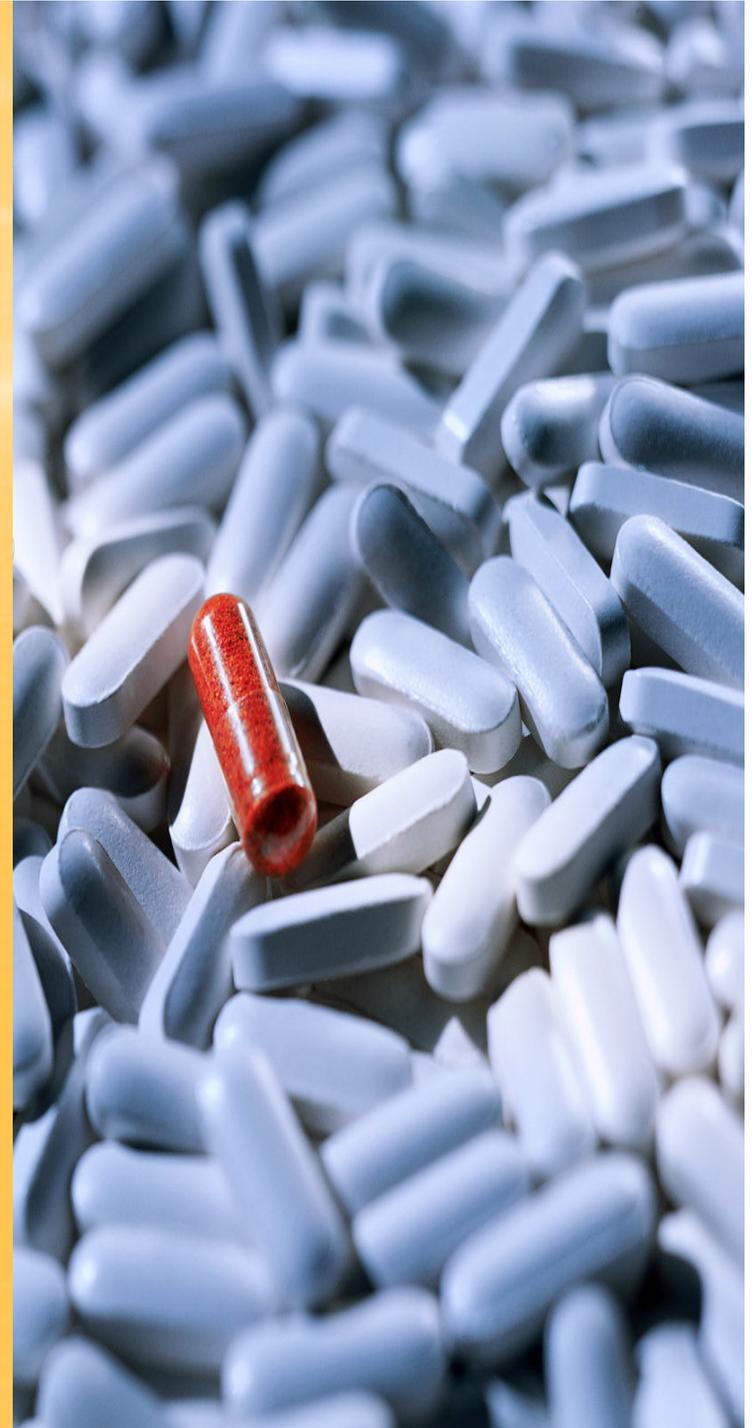
**Testing of soils that receive sludge done once per year**

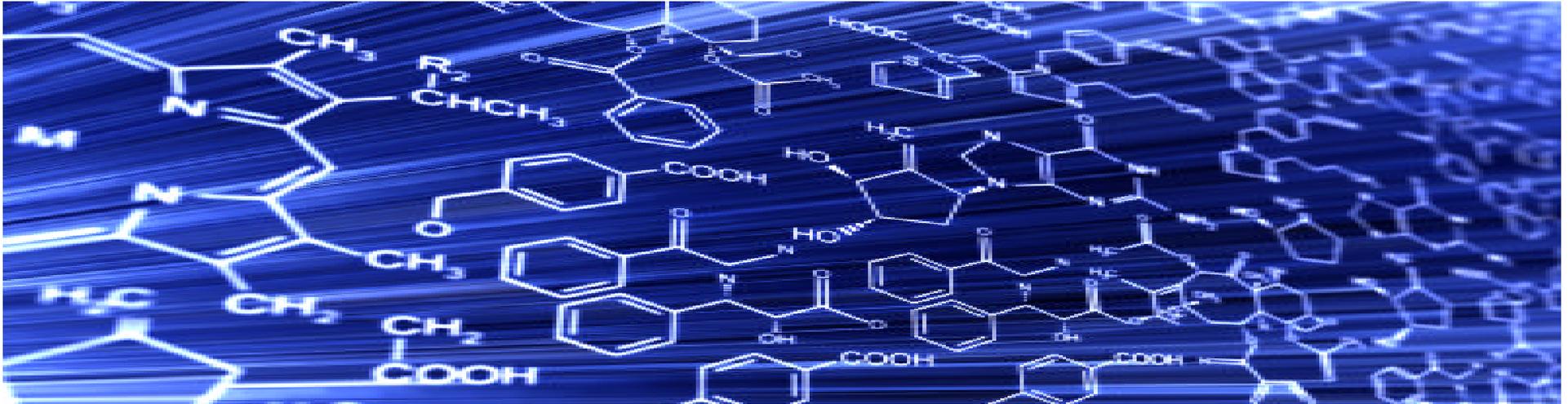
**Shipped to and spread on farmers’ fields free of charge.**

**Win-win situation.**

# WWTPs do not test or remove:

- Unregulated chemicals
- Emerging chemicals
- Specific pathogens (MRSA, swine flu, H1N1 viruses, Tamiflu vaccine, hepatitis A, Herpes virus, Poliovirus, Necrotizing bacteria)
- Prescription pharmaceutical drugs, illegal drugs
- Hormones
- Steroids
- Endocrine disrupting chemicals
- Flame retardants
- Radioactive substances
- Toxic metals
- Polychlorinated biphenyls
- Dioxins
- Polymers used to solidify sludge
- PAHs (polycyclic aromatic hydrocarbons)
- Prions
- Nanoparticles
- Unknown chemicals





- **1976 Toxic Substances Control Act requires manufacturers to report to the federal government new chemicals they intend to market. But the law exempts from public disclosure any information that could harm their bottom line.**
- **Estimated 84,000 chemicals in commercial use.**
- **Approx 700 new chemicals introduced into hands of consumers each year.**
- **20% of chemical ingredients protected as trade secrets.**
- **In March, 2010, more than half of the 65 "substantial risk" reports filed with the Environmental Protection Agency involved secret chemicals.**

"... makes it impossible for regulators to control potential dangers or for consumers to know which toxic substances they might be exposed to."

- *Obama Administration*

**The Federal Clean Water Act defines sewage sludge as a “pollutant”  
[33USC 1462 (6)].**

Part 503.9(t) Pollutant is an organic substance, an inorganic substance, a combination of organic and inorganic substances, or a pathogenic organism that, after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism either directly from the environment or indirectly by ingestion through the food chain, could, on the basis of information available to the Administrator of EPA, **cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunction in reproduction), or physical deformations in either organisms (humans) or offspring (children) of the organisms.**

(2008). EPA's "Targeted National Sewage Sludge Survey" (TNSSS) sampled 74 selected waste water treatment plants in 35 states during 2006 to 2007.

**High concentrations of toxic contaminants with heavy metals, steroids and pharmaceuticals, including the antibacterials, triclocarban and triclosan.** Despite the prevalence of these toxic chemicals in the environment and their potential adverse impacts to human health and the environment, EPA maintains that it is not appropriate to speculate on the significance of the results at this time.

Under the Clean Water Act (CWA), Section 405(d) stipulates that EPA must identify and regulate toxic pollutants that may be present in biosolids (sewage sludge) at levels of concern for public health and the environment.

<http://www.epa.gov/waterscience/biosolids/tnsss-tech.pdf>

Johns Hopkins studies (*Rolf U. Halden et al*) conclude that **50 percent of triclosan and 76 percent of triclocarban remain unchanged by aerobic and anaerobic digestion** in a typical WWTP. Both accumulate in sludge. Estimate that more than 100,000 lbs. of triclosan and 300,000 lbs. of triclocarban are spread on farmlands each year.

Heidler, Sapkota, Halden. Partitioning, Persistence, and Accumulation in Digested Sludge of the Topical Antiseptic Triclocarban during Wastewater Treatment. *Environ. Sci. Technol.*, 2006, 40 (11), pp 3634–3639

(2006). Eastern Washington University study found **dozens of medicinal, industrial and household compounds in treated sewage sludge**, also known as biosolids, that government agencies sell as lawn-and-garden enhancements.

"I don't think people understood before this that they might be applying pharmaceuticals and disinfectants to their front lawns."

- Thomas Burke, Professor of Public Health Policy, Johns Hopkins University

*What proof do we have that  
sludge is dangerous?*



On Nov. 9, 1998, McElmurray & Sons, Inc., and Boyceland Dairy Farms, filed separate lawsuits against the City of Augusta in the U.S. District Court in the Southern District of Georgia, **after the deaths of hundreds of dairy cattle and loss of hundreds of acres of productive farmland as a result of elevated levels of thallium, arsenic, chromium, PCBS, and molybdenum found in sewage sludge used as a fertilizer in 1998.** Cadmium and molybdenum were recorded at 37-1,400% higher than permitted levels.

[http://www.organicconsumers.org/articles/article\\_10789.cfm](http://www.organicconsumers.org/articles/article_10789.cfm)

Milwaukee, WI. (2007). City spent over \$4 million to scrape tons of Class A sewage sludge “Milorganite” off 30 public parks and playgrounds because it was contaminated with PCBs (polychloride biphenyl ethers). **Some PCB levels in the sludge exceeded EPA superfund limits.** Three more incidents of PCB contamination followed.

<http://www.jsonline.com/news/milwaukee/29278419.html>

Raleigh, NC (2008). The City of Raleigh **spent \$15 million to extend municipal water lines to residences with nitrate contamination to 16 private drinking water wells as a result of over-application of sewage sludge by the city.** Sludge runoff polluted the Neuse River, a drinking water resource for communities downstream of Raleigh.

<http://www.newhillca.org/wwdocs/RaleighWantsCleanupWaiver.pdf>

Lawrence County, Al. (2009) Farmers filed a class action lawsuit against Synagro, and local industries which discharged toxic, carcinogenic PFOAs and PFOS (\*perfluorinated chemicals, used in manufacturing Teflon products) into the sewers, resulting in **contamination of 5,000 acres of private drinking water wells, farmland, and livestock.** PFOAs and PFOs are carcinogenic to animals, and have been linked with birth defects, cancer, immune dysfunction, and liver damage. Synagro stated it did not test the sludge from Decatur Utilities for PFOAs because it did not know the sludge contained the compounds.

<http://www2.fluoridealert.org/Pollution/Perfluorinated-chemicals/Alabama-PFOA-contaminated-sludge-spread-in-Lawrence-County>

Dalton, GA. (2009). Spreading of “biosolids” from the sewer plant in Dalton, Georgia, was halted when **high levels of PFOAs and PFOs were found in the sludge**, which had been composted and sold to businesses and individuals in the Dalton area since 2003. Dalton Utilities estimated that 80 million pounds of the compost were sold and distributed. The Georgia Environmental Protection Division found the chemicals in soil, groundwater, and surface waters, including the Conasauga River and Holly Creek. Chemicals also found in bass and catfish. Impact studies (including blood and tissue analyses) on deer and turkey are being planned to determine potential impacts of PFOA and PFOS on the local wildlife population.

\*Note: EPA national drinking water PHAs for perfluorooctanoic acid (PFOA) = 0.4 ppm micrograms per liter and PFOs = 0.2 ppb. PFOA values ranged from 1,900 to 4,500 ppb and PFO values ranging from 210 to 2,500 ppb. The one sample of fresh sewage sludge had a concentration of PFOA of 91 ppb and PFOS of 210 ppb.

[http://www.epa.gov/region4/water/documents/doc\\_h\\_pfc\\_statement\\_daltonga.pdf](http://www.epa.gov/region4/water/documents/doc_h_pfc_statement_daltonga.pdf)

St. Joseph, MO. (2009). At least two dozen northwest Missouri landowners filed a lawsuit against the former and current owners of a tannery, the chromium manufacturer, and engineering firm that designed sludge system that provided **chromium-tainted sludge for use as a fertilizer on farms**. Several other lawsuits filed alleging the hexavalent chromium (chrom 6) found in the sludge caused a cluster of brain tumors.

<http://www.hpj.com/archives/2009/dec09/dec28/1221MOfarmlanddamagedsludge.cfm>

## Deaths attributed to sludge spreading, sewage

(1991) **Shayne Connor**, 22, of Greenfield, NH came home from college for Thanksgiving. Sludge had been spread near his home during week. Shayne always slept with the windows open. Thanksgiving night, his mother heard him call for help and found him having difficulty breathing with a high temperature. Hospitalized, and died within 24 hours with a diagnosis of community pneumonia. Family members also complained of illnesses they attributed to sludge. Twenty four persons in neighborhood complained of respiratory problems. Out-of-court settlement with gag order placed on Connor family by Synagro.

(1994) **Tony Behun**, 11, of Osceola Mills, PA, rode his dirt bike over a freshly sludge applied field. According to testimony, there were no signs or notices to restrict access. He became ill during the night and died of *Staphylococcus aureus* pneumonia within three days. The diagnosis and cause of death was listed as viral and *S. aureus* pneumonia.

(1995) **Danny Pennock**, 17, of Berks County, PA died within two weeks after riding ATV over a sludged farm field and then playing basketball outside (alone) near a sludge applied field. Same night developed a sudden onset high fever and respiratory distress. Placed in ICU to assist breathing; went into a coma overnight. MRI showed holes forming in his lungs. Diagnosis and cause of death, pneumonia, probable *S. aureus*.

**Seth Jones**, 26, of Erwin, TN is terminally ill and a resident of hospice. Worked spreading muni sludge for a farmer. He became suddenly ill with difficulty breathing and hospitalized for pneumonia. Developed tumors and abscesses in his lungs, liver and kidneys. A biopsy of both lower lobes of his lung showed via DNA the same bacteria present in the sewage sludge.

**A Copperbasin, TN, woman**, age 26, was white water rafting in the Ocoee River the day after raw sewage was discharged illegally into the river. She developed sudden onset atypical pneumonia and died three days later in the hospital. No autopsy was conducted, no investigation done because the discharge was not reported for over a month.

**In Cadiz, Ohio** a 30 year-old man went hunting and crossed sludge-applied fields near his home. He developed sudden onset flu-like symptoms and pneumonia. He was hospitalized, and now is unable to work because of severe joint pains. His mother and father both have severe and newly diagnosed respiratory problems they attribute to sludge in field next to house.

Harford County, MD. (2008) A 51-yr.old woman, Lin Eyer, rode her horse through a field of freshly spread sewage sludge in the Susquehanna State Park and **one week later became ill with an infection which physicians could not identify.** A dentist removed all of her teeth in an attempt to stop the infection. Bills introduced in the Maryland General Assembly to ban companies from leasing parkland to spread sludge. Efforts by residents to stop the sludge spreading by Texas-based Synagro were finally successful.



[http://74.125.47.132/search?q=cache:fFZfIwlPrm4J:www.sludgevictims.com/pdf\\_files/MARYLAND-SUSQUEHANNASTATEPARK-VICTIMONHORSE.doc+Lin+Eyer,+sludge+spreading,+MD&cd=1&hl=en&ct=clnk&gl=us](http://74.125.47.132/search?q=cache:fFZfIwlPrm4J:www.sludgevictims.com/pdf_files/MARYLAND-SUSQUEHANNASTATEPARK-VICTIMONHORSE.doc+Lin+Eyer,+sludge+spreading,+MD&cd=1&hl=en&ct=clnk&gl=us)

A University of Toledo study (2007) of residents living in Wood County, OH, near farm fields permitted to receive sludge found ...

**... increased risks for certain respiratory, gastrointestinal, and other diseases among residents.**

Khuder et al, Health Survey of Residents Living Near Farm Fields Permitted to Receive Biosolids, Archives of Environmental & Occupational Health, Vol. 62, No. 1, 2007.



## Uptake by animals ...

- A recent study conducted by the University of Minnesota has found that vegetables such as corn, potatoes and lettuce absorb antibiotics when grown in soil fertilized with livestock manure.
- Livestock and dairy animals ingest large quantities of soil when grazing and consequently, sludge contaminants, which can ultimately end up in the food produced from these animals.
- Food animals may ingest contaminated soil attached to harvested animal feed crops.
- Many chemical contaminants (including dioxins, PCBs, pesticides and some flame retardants), and a few heavy metals (such as cadmium) found in sludge tend to bio-accumulate in fat tissue and milk fat.



## Uptake by crops ...

- Food crops grown on sludge-applied lands can absorb some heavy metals. Heavy metals persist in soils. Plants can continue to take up heavy metals for decades after sludge is applied.
- Cadmium and lead readily taken up from sludge-amended soils by various food crops, including carrots, potatoes, lettuce, spinach and grains.
- Some synthetic chemicals found in sludge may build up in the food chain.
- Various food crops absorb dioxin and dioxin-like compounds from contaminated soil, although cucumbers and related vegetables (e.g. zucchini, pumpkin) take up more dioxins than other plants, and the uptake is related to the level of contamination.
- Carrots take up into the interior (and/or the peel) some solvents (chlorobenzenes), chemicals from perfumes and scented products (polycyclic musks), and polycyclic aromatic hydrocarbons (PAHs), a class of chemicals found in dyes and plastics, among other places.

# USEPA National Water Program Research Compendium 2009-2014

## ***Concerns about emerging contaminants ...***

- Because of their known or suspected adverse ecological or human health effects: endocrine disrupting chemicals (EDCs), pharmaceutical and personal care products (PPCPs), nanomaterials, fluorinated compounds, and pathogens – various protozoa, bacteria, viruses, and prions

## ***Questions about ....***

- How antimicrobial resistance in wastewater streams impact treatment processes
- Fate and transport of emerging contaminants in land-applied biosolids, septage, animal manure
- Effects of nanomaterials on POTWs; abilities of nanomaterials to survive treatment process and appear in products produced from land-applied biosolids
- No tests to assess for emerging pathogens, from viruses to prions, for example.

**“The spreading of Class B sewage sludge on farmlands should be banned immediately.”**

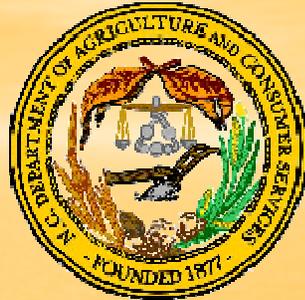
*Dr. Ellen Harrison, Former Director  
Cornell Waste Management Institute*

*\*Conclusion reached after a 2002 study of 328 symptoms at 39 incidents of sludge spreading in 15 states.*

**“Our ability to confidently predict risks from land application is very limited; contaminants concentrate in sludge and many are unevaluated; present standards for risk are based on a risk assessment with many short-comings; enforcement and monitoring are inadequate; if there are problems they are hard to prove.”**

*Dr. Murray McBride, Soil Scientist  
Cornell Waste Management Institute*

## North Carolina Department of Agriculture and Consumer Services



The mission of the NC Department of Agriculture and Consumer Services is to operate regulatory and service programs that ensure the availability of **life-sustaining food and natural fiber, free of adulteration and contamination, and produced in a manner consistent with environmentally sound production practices;** and to operate programs to benefit consumer and agricultural producers, to protect the environment, **health, and economic well-being** of all North Carolina citizens and business enterprises.

**HB 1170 -  
Study bill introduced in 2009 NC General  
Assembly by Rep Curtis Blackwood**

AN ACT TO DIRECT THE DEPARTMENT OF AGRICULTURE AND CONSUMER SERVICES TO STUDY WHETHER THE CURRENT REGULATIONS OF THE LAND APPLICATION OF SEPTAGE AND SLUDGE ADEQUATELY PROTECT HUMAN HEALTH AND THE ENVIRONMENT.

## Work with Soil and Water Conservation Districts to:

... identify locations, total volume and source of septage/sludge being spread or land applied and make available to each county;

... make information available to county commissioners of each county where spreading is taking place;

... determine fees necessary to establish "sufficient testing to be assured that any septage/sludge that is spread is free of pathogens and heavy metals so that neither material spread or runoff or airborne residue of that material are capable of having a cumulative negative health impact on human health, the land, or the flora and fauna;"

... work with UNC to identify "cost-effective alternatives to land application as a method of disposal that protect public health and protect farmland from the cumulative effects of using farmland as a waste disposal facility."

# Recommendations

## NCSU/NC Department of Agriculture and Consumer Services:

1. Types/amounts of emerging trace organic chemicals (TOCs) found in Class A and B sludges.
2. Impact of TOCs in Class A and Class B sewage sludge on farmland sustainability (soil, food crops, domestic animals) and surface waters (fish, aquatic life).
3. Existing state-federal regulations for Class A and Class B sludges - are they protective of human health and the environment?
4. Research SAFE alternatives to land application of sewage sludge.

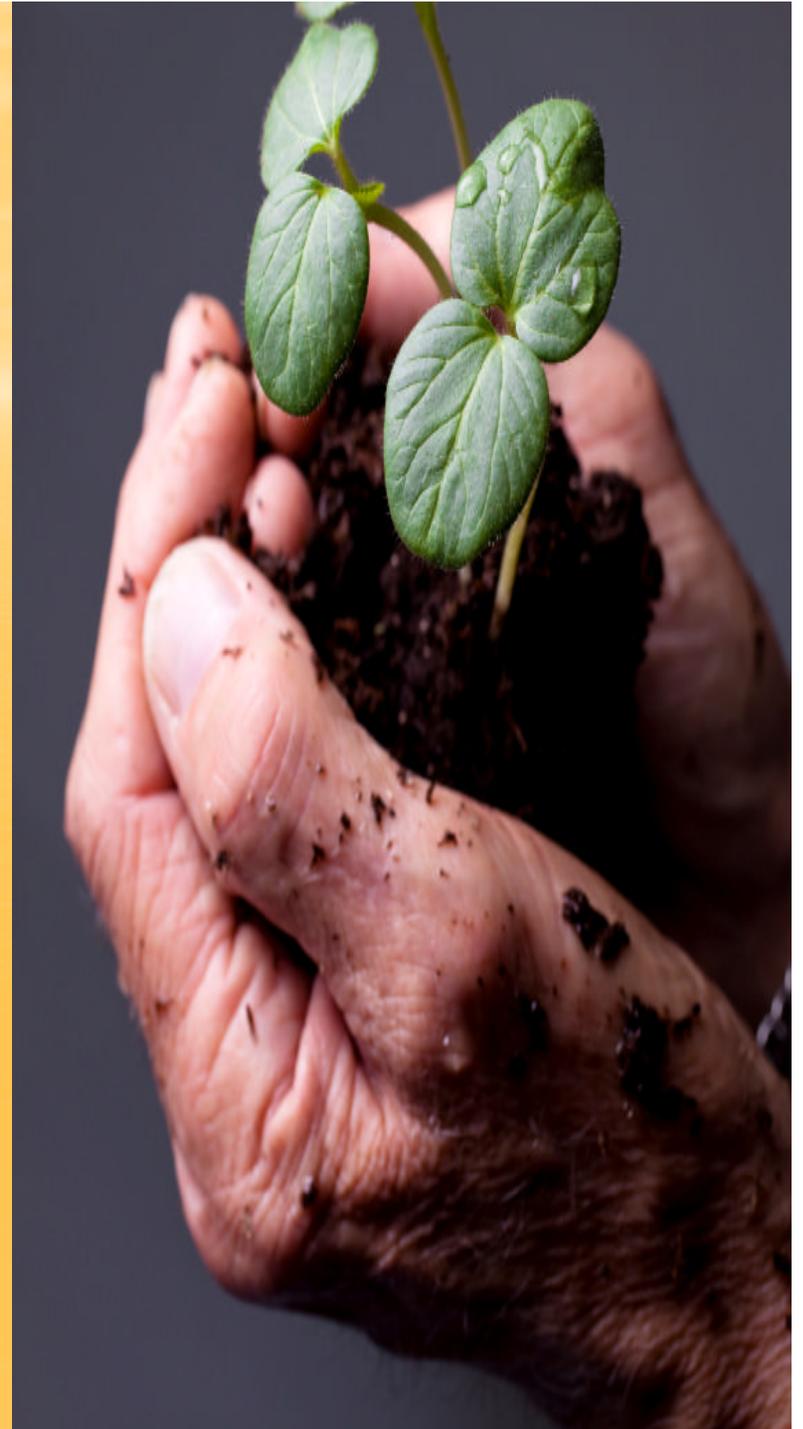
# NC DENR Division of Water Quality

1. Full disclosure to farmers and the public re: TOCS and potential risks.
2. Disclosure of sludge spreading on property deeds.
3. Require labeling of sludge in compost materials.
4. Test sludge runoff for 9 toxic metals, total coliform, and nutrients AND specific emerging TOCs (endocrine disrupting chemicals, pharmaceuticals)
3. Increased setbacks for sludge spreading next to schools, day care centers, churches, and residences, with additional measures for sensitive populations
4. Increased setbacks to surface waters
5. Immediately remove all sludge fields located in critical watersheds from permits issued before and after 1992.

On July 13, 2000, the US House Science Committee held a hearing on the 1999 National Research Council report entitled "Strengthening Sound Science at the US EPA". The 503s were singled out as an example of regulation that is being driven by politics, rather than by sound science.

“Agriculture is not a place to dump unwanted things; our agricultural soils are unique, we depend on them, we don’t create new ones ... and when they become severely contaminated, you have a real problem.”

Ellen Harrison, Director  
Cornell Waste Management Institute  
Interview, “The Sludge Diet,” 2008



**For information on references regarding statements and studies  
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# Sludge Victims

<http://www.sludgevictims.net/>