

Zero Waste

Land Application of Sewage Sludge

Guidance

BACKGROUND ON THE PROBLEM

Although the Sierra Club supports the use of pathogen- and pollutant-free treated human waste as fertilizer, such a practice is only possible by separating the industrial waste stream from human waste. Sewage treatment plants are not designed to separate wastes and to produce fertilizer. They were designed to remove pollutants from the wastewater. Many of these pollutants concentrate in the resultant sludges. As a result the exact composition of any sludge is unknown. Urban sludges are a highly complex, unpredictable biologically active mixture of organic material and human pathogens, some of which are resistant to antibiotics or cannot be destroyed through composting sludge can contain thousands of industrial chemicals, including dozens of carcinogens, hormone disrupting chemicals, toxic metals, dioxins, radionuclides and other persistent bioaccumulative poisons. The Federal Clean Water Act defines sewage sludge as a pollutant.

After ocean dumping was banned in 1989, the US faced a formidable problem: what to do with the estimated 10 to 15 million dry metric tons of sewage sludge produced annually. In 1993, the US EPA issued its land application rule, 40 CFR, Part 503 (the 503s) for the Use and Disposal of Sewage Sludges. To make sludge spreading more acceptable, it was called “recycling” and sludge that met the US land application standards was called “biosolids”. By classifying sludge as a fertilizer-rather than as a pollutant- it became exempt from several laws governing waste disposal. Current federal regulations have standards for only nine metals. The United States land application regulations are the least protective of any in the industrialized world. For example, the cumulative metal loading allowed under these rules result in soil contaminant levels approximately an order of magnitude higher than those allowed under land application rules in most European countries.

GUIDANCE

There is growing agreement among scientists and environmentalists that the 503s need serious improvements. In 1997 the Cornell Waste Management Institute concluded that current regulations governing land application do not protect human health, agricultural productivity, and the environment (<http://cwmi.css.cornell.edu/Sludge.html>). In 2002, the National Research Council of the National Academy of Sciences (NAS) warned that the scientific underpinning of the 503s was based on outdated or nonexistent science. The NAS panel also warned that even if all of the contaminants of this complex and unpredictable waste mixture were known, single agent risk assessment, and using standard risk management strategies, would not be protective of human health. (www.epa.gov/waterscience/biosolids/nas/complete.pdf) In 2002, University of Georgia scientists published groundbreaking research that documents and explains how deaths and illnesses reported by sludge-exposed rural residents are linked to land application (www.biomedcentral.com/1471-2458/2/11)

On July 13, 2000, the US House Science Committee held a hearing on the 1999 National Research

Council report entitled "Strengthening 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. In 2000 the CDC/NIOSH identified Class B sewage sludge as a potential hazard to workers who handle this material, and the same year the EPA Office of Inspector General also concluded that due to lack of data and lack of oversight the EPA cannot assure the public that current land application practices are protective of human health and the environment. A September 6, 2002, Memo from the EPA Inspector General to EPA stated that the agency has not conducted the basic research needed to determine the risks associated with [the land application of sewage sludges]. A 2005 paper, published in the International Journal of Occupational and Environmental Health- www.IJOEH.com/pfds/IJOEH_1104_Snyder.pdf - documents how EPA, working with municipalities, state agencies, and industry-friendly scientists, covers up reported illnesses and deaths linked to land application. Public opposition to land application is increasing. The National Farmers Union opposes applying sludges to agricultural land. In 2003, 73 health, environmental, and farm organizations petitioned EPA to place a moratorium on land application of sewage sludges. EPA turned down the petition, citing fraudulent studies it had funded that alleged that land application was safe.

The Sierra Club opposes the land application of municipal sewage sludges as a fertilizer and/or soil amendment because the current policies and regulations governing this practice are not adequately protective of human health and the environment.

The Sierra Club recognizes, however, that more than half of the sewage sludges generated in the US are being disposed through land application. Because this practice cannot be banned overnight, the Sierra Club has developed Guidelines for Community Activists, as well as Recommendations for Research and for the National Program.

GUIDELINES FOR COMMUNITY ACTIVISTS

An increasing number of local governments are enacting ordinances to control land application in their communities in order to protect the health and welfare of their citizens. These communities need science-based guidelines for ordinances that are more protective than the federal and state regulations.

A 2001 paper on local ordinances published by the Cornell Waste Management Institute, provides a useful review of approaches taken by municipalities to address an array of local concerns <http://cwmi.css.cornell.edu/Sludge.html>.

These Sierra Club guidelines are not exhaustive. Nor should they be interpreted as an endorsement of land application. They are offered to activists so they can inform farmers, property owners, citizens, and local governments who want to reduce some of the hazards of land application.

1. Several deaths and many adverse environmental and health incidents have been linked to land application, especially to composting operations and to Class B sewage sludge that is stockpiled and/or spread on hayfields, pastures, and other no-till sites. To reduce pathogen exposure and exposure to sludge odors and to airborne sludge contaminants and to reduce groundwater and surface water contamination, sludges should not be top dressed but immediately incorporated into the soil; sludges should not be stockpiled on site. Some communities may want to ban the stockpiling and land application of Class B sewage sludges altogether.
2. To prevent dairy cattle from ingesting sludge contaminants (including dioxins), sludges should not be placed on grazing pastures. Forages grown on sludged land should be tested for toxic metals and organic compounds.

3. To prevent ground water contamination, sludges should not be placed on karst, or on excessively drained soil and/or on sites with shallow and varying water tables.
4. To protect soils and crops, nutrient and pH management plans should be required for all agricultural applications. Soil pH that is either too high or too low can mobilize toxic metals. Permanent pH management is necessary at sludged sites, especially in regions with acid soil and acid precipitation.
5. To reduce exposure to airborne contaminants, including endotoxins, extensive buffer zones should be established. Some communities require a 5 mile radius for open composting facilities and a ½ mile setback from residents from sites that have been treated with Class B sludge.
6. To keep children, pets, and wildlife away from newly sludged sites, these sites should be securely fenced and posted for 12 months after the last Class B application. Signs should use all languages spoken in the area.
7. Do not use any sewage sludge products on home vegetable gardens. Keep children away from sludge products.
8. To protect your community's natural resources for future generations, refuse sludge from highly industrialized urban centers, from treatment plants that receive superfund or toxic waste site leachates, and from plants that accept nuclear waste.
9. Insist on low application rates that take into account previous sludge applications and soil contaminants from other sources, as well as nutrients.
10. The 2002 NAS report suggests that *Clostridium perfringes* might be a better indicator organism than fecal coliforms to assess the efficacy of sludge disinfection processes because they are hardier and apt to survive the current methods of pathogen reduction.
11. Record sludge applications on property deeds.
12. Request indemnification against potential liabilities from sludge spreading.
13. Require testing for a number of organic compounds, including halogenated organic compounds, linear alkylbenzene sulfonates, Di(2-ethylhexyl) phthalate, nonylphenol and nonylphenolethoxylates, polycyclic aromatic hydrocarbons (acenaphthene, phenanthrene, fluorine, fluoranthene, pyrene, benzo(b+j+k) fluoranthene, benzo(a) pyrene, benzo(ghi) perylene, ideno (1,2,3-c,d) pyrene, polychlorinated biphenyl congeners, polychlorinated dibenzodioxins, and dibenzofurans.
14. Require a performance bond.
15. Establish a local enforcement and monitoring program.
16. Require and establish a method to deal with complaints.

RECOMMENDATIONS FOR RESEARCH AND THE NATIONAL PROGRAM

1. The deficiencies of the current land application policy cannot be addressed by merely "fine tuning" the existing rules or by issuing guidance documents or adopting voluntary sludge management systems. Long-term, a policy that deliberately allows the addition of persistent pollutants to the nation's farm and forest soil is indefensible.

THEREFORE the Sierra Club urges the EPA and industry to investigate and support safer, non-polluting alternatives for sludge use and disposal beyond land application.

2. The Sierra Club urges EPA to shift research priorities. Currently the promoters of land application are also its regulators. This is a serious conflict of interest. Tax dollars are being spent for crisis management, for aggressive PR campaigns, and for funding fraudulent research, based on fabricated data, to "prove" that land application is safe, rather than on supporting unbiased research that would make land application safer. Research funds should not be administered by those who have a financial stake in the outcome. Research needs include unbiased, independent investigations of reported incidents of health and agricultural impacts from land application. Individuals who believe they have been impacted, as well as independent technical experts, must be involved in the determination of the research objectives.

3. Data are needed on the long-term effects of sludge on soils; on identifying and regulating the many pollutants of concern that currently are not regulated or monitored; on why land application adversely affects human health and live stock; and on how land application affects wildlife, nonagricultural plant communities, aquatic organisms, forest ecosystems, and wildlife habitats. In fact, beyond the Oak Ridge National Laboratory literature review, EPA has not addressed these ecological impacts of sludge spreading. Data are needed on the identity, prevalence, fate, transformation, transport, and survival of disease causing pathogens, and airborne sludge contaminants. Data are needed on chemical mixtures and their toxicologic interactions in sludges, and how they affect human health and the environment.

4. Improved methods need to be developed and used to identify, monitor, and eliminate pathogens from sludges. Required management practices need to be improved to prevent exposure of people and animals. Class B sewage sludges contain significant levels of pathogens, some of which can survive in soil for months, even years. There is evidence that sludge odors and airborne contaminants are associated with illness. Current treatment and management practices are not adequate to prevent off-site odors. Beyond David Lewis' groundbreaking article (www.biomedcentral.com/1471-2458/2/11) that documents and explains the illnesses and deaths attributed to sludge-exposure, no valid health studies have been conducted by EPA to assess how current land-application practices impact human health. Even though the 2002 NAS panel urged EPA to implement such studies, the agency has stated that it has no plans to do so.

5. To protect soil and groundwater from persistent sludge contaminants and from over application of phosphorus, application rates must be based on many other factors than the nitrogen needs of a given crop or the cumulative loading of the handful of regulated toxic metals.

6. Current allowable levels of metals in sludge and sludged soil need to be radically lowered. Pollutant tracking and site restrictions are necessary for all sludge types, including so-called Class A EQ sludge.

7. Any land application policy must be based on valid scientific principles and include enforceable and enforced regulations.

8. If land application is to remain a disposal option, industry and government must abandon the current risk-based approach (which allows the accumulation of persistent pollutants in soil, until the land has been permanently degraded). Instead, land application must be based on the ecological principle of sustainability and non-degradation. In 1996, a National Research Council panel affirmed that a non-

degradation policy for land application is based "on a valid scientific principle." Healthy farm and forest soils are a precious and limited resource. Preserving and protecting this resource should be a high priority. Any land application policy must be based on sustainability with a goal that no persistent toxic chemicals be added deliberately to soil beyond background levels.

The European Union, aware of the need to protect soils in perpetuity, has based its land application policies on the principle of non-degradation and sustainability with much more protective regulations. And the European community has plans for even stricter regulations in the future. In fact, several European countries are following Switzerland's example of phasing out land application altogether.

In contrast, the US EPA appears to be headed in the opposite direction. Instead of tightening the regulations that would improve sludge quality and sludge management, EPA no longer regulates dioxins and dioxin-like compounds, no longer requires post-storage pathogen testing, no longer requires certification that pathogen reduction and vector attraction reduction requirements for Class B sludge have been met, significantly weakened the Class B pathogen sampling requirements, and allows radionuclides, including plutonium and radium, in sludges that are used for growing food and feed crops. In addition, the metal products industry and AMSA are successfully resisting EPA's proposed tighter pretreatment standards for metals. Meanwhile the amount of toxic material being discharged into sewage treatment plants has increased every year since 1996.

Finally, there is increasing evidence of risks from unregulated and unmonitored organic compounds concentrating in land applied sludges (<http://cwmi.css.cornell.edu/Sludge.html> and Kinney Chad et al. Survey of Organic Wastewater Contaminants in Biosolids Destined for Land Application (2006). Environ. Sci. Technol.

Developed by the Zero Waste Committee (Caroline Snyder Lead) and approved by EQST on February 18, 2008.