



WASHINGTON STATE
DEPARTMENT OF
E C O L O G Y

Hog Fuel Boiler / Wood Ash Action Plan

Executive Summary

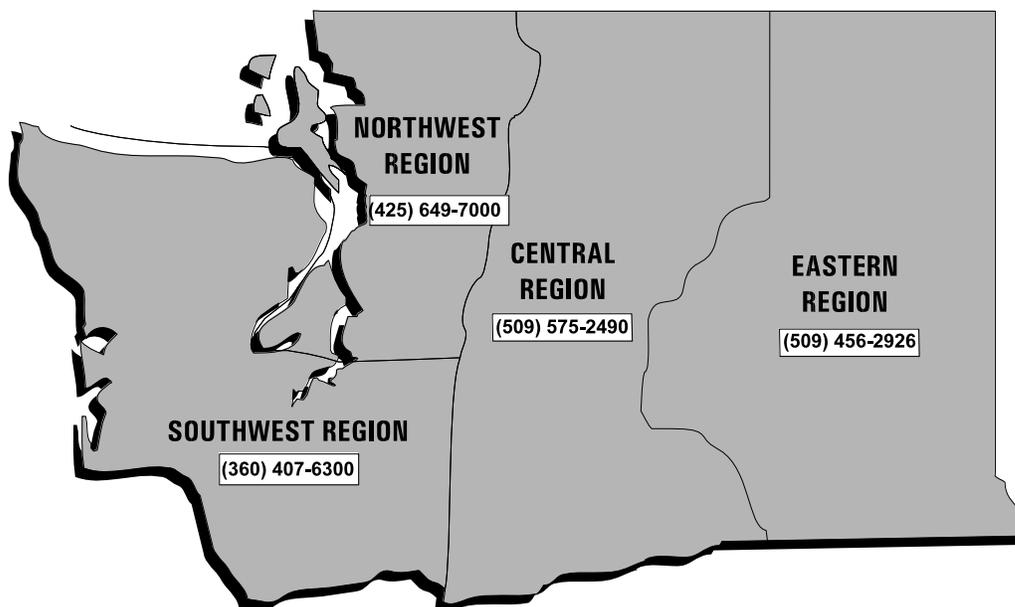
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The information in this summary (as well as the full text Technical Report) is provided here so that the citizens of Washington can have a better understanding of this issue and informed decisions can be made regarding the future management of this dioxin-containing waste.

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Purpose

This paper is a summary of a more detailed action plan and technical report that addresses the management of a wood fuel-burning waste known as "wood ash." The Technical Report includes details on issues surrounding wood ash from wood-fired boilers as well as a technically based discussion of the history of wood ash and current management practices. The Technical Report is available on request.

Under certain conditions, wood ash may be spread on Washington state lands as a soil conditioner. Because wood ash may contain dioxins, the Department of Ecology (Ecology) is concerned about this practice. This summary explains the rationale for that concern.

The paper concludes by outlining action recommendations for the improved management of wood ash developed by Hazardous Waste and Toxics Reduction Program staff at Ecology. This summary, including proposed recommendations, is provided so informed decisions can be made regarding the management of this dioxin-containing waste.

What is Wood Ash?

Wood ash is the ash residue generated by wood-fired boilers used by certain industrial facilities. Wood-fired boilers (also called hog fuel boilers because the wide variety of wood and wood wastes used to feed the boilers is called "hogged fuel") generate over 200,000 tons of wood ash each year.

Wood ash is a waste that often contains dioxin. In recent years, more information has become available on the sources of dioxin, its impacts on human health and the environment, and the levels of dioxins in Washington state soils as well as various materials such as wood ash that are commonly spread on the land.

Due to its high pH, wood ash is a corrosive material and sometimes it also has high levels of metals. As a result of these characteristics, wood ash is sometimes considered a hazardous waste. However, since 1994, wood ash that would be a hazardous waste solely due to its corrosive nature (pH of 12.5 or above) is exempted from Ecology's *Dangerous Waste Regulations*. This allows the wood ash to be disposed in solid waste landfills rather than the more costly (and out-of-state) hazardous waste landfills, or it can be applied to the land as a "liming agent" to adjust the soil pH or acidity. The low pH of some Washington soils requires neutralization with a high pH material to improve productivity.

Background

An exemption from the *Dangerous Waste Regulations* for wood ash was adopted in 1994, in part, to encourage use as a soil amendment. Ecology is re-evaluating that exemption in light of increasing information on the human and environmental effects of dioxin compounds. Dioxins are a large group of complex chlorinated compounds that are toxic to humans and animals. The most common source of dioxins is thought to be emissions from combustion processes. Due to their long half-life, dioxins are persistent in the environment and do not readily degrade over time. Ecology is concerned that the persistent nature of dioxins will result in an accumulation of dioxins in Washington soils if the practice of land application of wood ash is not restricted to a greater degree than the regulations currently allow.

To obtain an understanding of the existing levels of dioxins in soils across the state and to gain some perspective on this issue, Ecology conducted a study in 1999 to determine the level of dioxin in Washington soils. Tests conducted for that study showed that dioxins are present in soils across Washington, the highest concentrations being in urban areas. Even soil samples from forested lands contain low levels of dioxins. However, Washington's average soil dioxin level of 1.4 parts per trillion (pptr) TEQ¹ appears to be below the national average of 8 pptr TEQ as reported by the United States Environmental Protection Agency. Continued land application of wood ash that contains dioxins could result in increased soil concentration levels of dioxin, possibly even surpassing the state cleanup level for residential soils of 6.67 pptr 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (this is considered the most toxic form of dioxin).

Current Status

Of 64 facilities in the state known to be utilizing hog fuel boilers, 39 of those facilities responded to an Ecology survey about the management of their wood ash. Thirty-seven facilities generate wood ash at a rate of more than 200,000 total tons per year. Currently, 17 of those 39 facilities are known to be land applying wood ash in Washington. However, it should be noted that several companies that contribute most of the wood ash to the 200,000 tons per year total have voluntarily stopped land applying wood ash. Two facilities responding to the survey did not give enough information to be included in wood ash volume estimates.

¹ TEQ means Toxic Equivalent or the sum total of the toxicity of 17 of the 210 forms of dioxins and furans. The calculation of TEQ for an environmental sample containing 5 pptr 2,3,7,8-TCDD and 23 pptr 2,3,7,8-TCDF (considered 1/10 as toxic as 2,3,7,8-TCDD; it has a Toxicity Equivalency Factor or TEF of 0.1) is: $[5+(0.1 \times 23)]=7.3$ pptr TEQ (Serdar et al., 1991).

While most wood ash in the state is currently landfilled (Table 1), those facilities identified as still land applying their wood ash do so at a rate of nearly 31,000 tons per year in total. The land application of wood ash may significantly increase levels of dioxins in soils because of the high application rates of wood ash and the low levels of dioxins in Washington soils. This is a concern for Ecology.

Table 1.
Wood Ash Management by Method (tons/year)

	Land Applying (17 facilities)	Landfilling (20 facilities)
Total	30,920	180,002
Average per Facility	1,819	9,000

(The chart on page 7 shows detailed information on wood ash management gathered through Ecology's survey of hog fuel boiler facilities.)

Ecology's concerns about the land application of wood ash were sparked by dioxin and heavy metals tests conducted in 1997 and 1998 on wastes used for fertilizers, liming agents, and soil amendments. Ecology's tests indicated that dioxins and heavy metals were sometimes present in fertilizers and dioxin concentrations in some wood ash vary from less than 1 pptr TEQ to more than 800 pptr TEQ. These data, combined with the high application rates reported for wood ash, suggest that use of wood ash could significantly increase the dioxin and metals levels in the soil.

Ecology's testing on agricultural soils to measure existing dioxin levels indicated very low dioxin concentrations in Washington's agricultural soils. The median value for dioxin in agricultural soils was determined to be 0.054 pptr TEQ. However, dioxin concentrations in wood ash from one facility that Ecology sampled ranged from 7.4 - 36.0 pptr TEQ. As a result, even a low dioxin wood ash applied at the typical application rate for liming agents could easily result in a significant increase in the dioxin concentration level (0.15 - 1.53 pptr TEQ) for many Washington agricultural soils.

Are We Creating Contaminated Sites?

In Washington, sites contaminated with toxics (often from industrial activities) are required to meet certain "cleanup standards." The cleanup standards are set by the Model Toxics Control Act (MTCA), which has governed the cleanup of contaminated sites since 1990.

Industrial contamination isn't the only source of contaminated sites. In the past, prior to implementation of MTCA, problems were created when orchards became contaminated from repeated applications of a lead arsenate pesticide. Homes have been built on old orchards even though the land sometimes exceeds MTCA Method A cleanup standards for residential use for lead (250 mg/kg) and arsenic (20 mg/kg), creating potential exposure pathways for residents.

The potential exists for history to repeat itself with dioxin contamination. As indicated, Washington state soils are relatively clean, containing only low levels of dioxins. Ecology would like to keep them that way.

The MTCA cleanup standards help give some perspective to the situation. The current MTCA Method B residential soil standard for dioxin is 6.67 ppb 2,3,7,8-TCDD and, as indicated above, a single application of wood ash with a low concentration of dioxin can raise the dioxin concentration level in agricultural soils to 1.53 ppb TEQ. Multiple applications of even a low dioxin concentration wood ash on the same parcel of land could result in that land exceeding the MTCA cleanup standard for dioxin.

Conclusions

1. Of those facilities surveyed, it appears that most wood ash in the state is landfilled. The pulp and paper facilities landfill out of liability concerns. Since they are aware that wood ash can contain heavy metals and dioxins, they do not want to be sued for past practices. While the smaller facilities may not have as much concern about liability, landfilling is often the easiest option for them.
2. To date, Ecology has identified seventeen facilities that are known to be land applying their wood ash at a rate of approximately 31,000 tons/year in total. There are a number of smaller facilities using hog fuel boilers whose wood ash management methods are still unknown.
3. Since Abitibi Consolidated in Steilacoom closed down (December 2000), only one major pulp and paper facility is still land applying their wood ash (Boise Cascade - on their own land). NOTE: Some of the paper mills and smaller facilities using hog fuel boilers are also land applying wood ash.
4. The land application of wood ash may significantly increase levels of dioxins in the soils due to the high application rates of wood ash in combination with the low levels of dioxins currently in Washington's soils.

5. Test results for dioxins in wood ash vary. The pH for most wood ash is at the threshold that will determine if it is a solid waste or a hazardous waste. Ecology does know some wood ash is hazardous as determined by measuring the pH and some wood ash contains significant levels of dioxins.
6. Ecology does not have test results for dioxin or pH levels from the wood ashes generated by smaller facilities using hog fuel boilers, so it is not known if the various wood ashes from these types of facilities are hazardous.
7. EPA's risk assessment concluded there is an increased risk to highly exposed individuals (i.e., farmers) due to the dioxins in a sample of ash from a facility in Washington State at the specified application rate. However, Ecology is also concerned that current risk assessments do not address the ecological impacts of dioxins.
8. From a public policy point of view, it doesn't make sense to knowingly allow dioxins to be added to Washington's soils when there is a potential to create sites contaminated with dioxins. Ecology has determined that wood ash containing dioxins above certain levels (to be determined) should not be land applied. Levels of dioxin allowed in solid waste that is land applied under a solid waste permit may be negotiated in the context of certain permit conditions, for example, monitoring the dioxin concentrations in soils.

Proposed Action Plan / Recommendations

Over a period of time, Ecology developed several options to address the issue of dioxins in fertilizers, in general, and wood ash specifically. These options included a number of possible approaches including: setting a maximum standard for dioxin in fertilizers; developing Memoranda of Agreement with generators of wood ash that designates as a hazardous waste to limit the amount of dioxin being land applied; prohibiting certain materials including wood ash from being made into fertilizers.

These options were discussed with wood ash generators, the environmental community and others to gather feedback before determining what course of action to take to address the issue of dioxins in fertilizers that are applied to the land.

Based on this information, Ecology is proposing an action plan that states:

- A. At a minimum, wood ash should not cause soils to exceed MTCA cleanup levels for dioxins, and ideally, wood ash that is land applied should not cause dioxin levels to exceed background levels for soils in that area.
- B. Ecology should test 6 to 12 facilities' hog fuel boiler ash for dioxin and pH and report the results by fall 2001. Samples will be taken at smaller facilities with hog fuel boilers that are known to be land applying wood ash. Ecology currently has no data on the ash from these types of facilities.
- C. If the test results show dioxins are present in wood ash from smaller facilities using hog fuel boilers, then in the fall of 2001 Ecology should publish guidance to help those facilities minimize dioxin production.
- D. Beginning in the fall of 2001, before a facility land applies a hazardous waste wood ash, a Memorandum of Agreement should be negotiated and signed by both Ecology and the facility. Ideally, this includes both on-site and off-site land applications to avoid creating future cleanup sites. The Memorandum of Agreement would require regular testing of the ashes as well as soils and it would require certain environmental safeguards (e.g., application restrictions near water, application rates that ensure background soil concentrations for dioxins will not increase, etc.). Such a Memorandum of Agreement could be developed by Ecology's Hazardous Waste and Toxic Reduction Program staff, but would be done in cooperation with Ecology's Solid Waste and Financial Assistance Program staff to ensure consistency with solid waste permitting and beneficial use determinations.
- E. Within two years, Ecology should evaluate the wood ash data and the success of the Memoranda of Agreement approach and decide if a rule for the regulation of dioxins in wood ash is necessary. It is likely that both the dangerous waste and solid waste rules would need to be amended and those amendments might include the following:
 - A requirement for pH and dioxin testing of land applied wood ash;
 - Notification to property owners (if off-site) by the seller of pH and dioxin test results of the wood ash;
 - Prohibition of certain uses of wood ash such as fill material around new buildings;
 - Modifications to the wood ash exclusion that would result in a smaller quantity of wood ash being exempt from the *Dangerous Waste Regulations*; and
 - Adoption of a dioxin standard into the review criteria for waste-derived and micronutrient fertilizers.