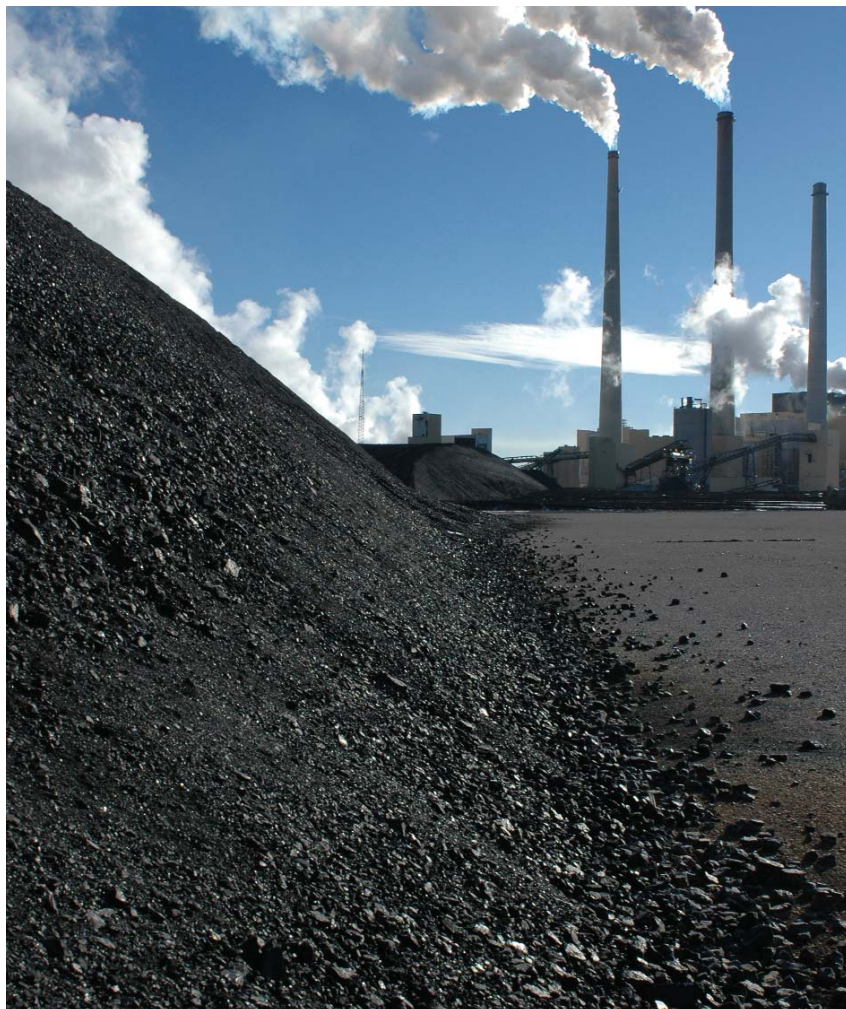


# WHAT REMAINS: THE LEGACY OF COAL COMBUSTION WASTES

The final stage of the life cycle of coal is the wastes that remain after coal is turned into electricity. Known collectively as coal combustion wastes, these toxic byproducts are a combination of solid and liquid wastes produced at coal plants. Although the chemical composition of coal wastes is dependent on a range of factors like coal origin and pollution controls,<sup>109</sup> the types of wastes produced are nearly identical at all coal-fired power plants. For example, these wastes include parts of the coal that do not fully burn during generation like fly ash (from the smokestacks) and bottom ash (from the bottom of the boiler).<sup>110</sup> They also include the particles and chemicals trapped by air pollution controls, like scrubber sludge or flue gas desulfurization sludge. Finally, they include many “low-volume” wastes, including runoff from coal reserve piles and liquid wastes that are formed during cleaning and routine operations.<sup>111</sup>

Taken together, the amount of coal combustion wastes produced every year is staggering: more than 120 million tons of solid wastes are produced every year.<sup>112</sup> This waste alone is enough to fill a million railcars every year, or a train that is 9,600 miles long.<sup>113</sup> In addition, the amount of wastes and their toxicity are expected to grow significantly every year as dirty old coal-fired power plants are forced to clean up and install modern pollution controls that convert air pollutants to solid wastes.<sup>114</sup>

Although some solid coal wastes can be used in construction materials, most coal wastes are destined for landfills or surface impoundments.<sup>115</sup> Surface impoundments are large open waste pits that are used to hold both liquid and solid coal wastes. Over time, the solids settle to the bottom of impoundments, where they may be removed and transferred to a landfill. Landfills are used to hold solid wastes, but water may be added to help reduce the amount of dust stirred up during disposal. The size of surface impoundments and landfills can be enormous, with some impoundments covering 1,500 acres—the size of over 1,100 football fields—and an average landfill holding 3.8 million cubic yards of wastes.<sup>116</sup> In 1999, there were at least 600 coal waste impoundments and landfills located onsite at 450 coal-fired power





plant facilities.<sup>117</sup> The majority of these waste facilities are concentrated in the Midwest, where there is a greater density of coal-fired power plants.<sup>118</sup>

Another destination for coal combustion wastes that has been gaining increasing attention is abandoned coal mine sites.<sup>119</sup> In theory, coal wastes applied in small amounts may help seal off old mine rooms and walls, forming a layer to help trap coal mining residues from leaking.<sup>120</sup> Coal wastes applied in large amounts may be used as backfill for mine sites, adding materials to help fill in the enormous voids formed when the coal was removed during mining.<sup>121</sup> However, because there has been little attention to this method the full environmental dangers of these applications remain undocumented and need to be studied.

Not only is it challenging to find a place to store so much coal combustion waste safely, but even after it is stored coal combustion waste can leak out and pollute the surrounding environment and groundwater. At landfills, leaks can occur when contaminated water percolates through the wastes or when water washes over exposed areas and carries off contaminants.<sup>122</sup> The opportunities for leaks at

surface impoundments are even greater because they are often exposed, increasing the likelihood of polluted runoff into ground and surface waters.<sup>123</sup> In 2005, there were 24 acknowledged cases of environmental pollution from leaking landfills and impoundments, and many more suspected cases.<sup>124</sup>

These leaking coal wastes and polluted runoffs can be extremely toxic and dangerous. Containing elements like lead, mercury, and arsenic in toxic doses,<sup>125</sup> coal combustion wastes and their pollution have been shown to cause illness and death in plants and animals. Direct exposure to these toxins and others causes lower rates of reproduction, tissue disease, slower development, and even death.<sup>126</sup> These damages are significant both individually and collectively, where coal waste contamination has been linked to changes in wildlife concentrations and disruptions in entire ecosystems.<sup>127</sup> Vegetation growing on or nearby coal waste disposal sites also exhibit signs of damage, including reduced growth and die offs.<sup>128</sup> These toxic compounds can accumulate in exposed animals and plants, causing the toxics to make their way up the food chain when they are eaten.<sup>129</sup>

The same toxics that harm plants and wildlife also pose serious health risks to people.<sup>130</sup> People are exposed to these wastes through contact with contaminated soils, inhaling polluted dust, and eating plants and animals that have been



[www.ohvec.org/](http://www.ohvec.org/) [www.sludgesafety.org](http://www.sludgesafety.org)

exposed.<sup>131</sup> Some coal combustion wastes are applied directly to agricultural fields, and evidence suggests that subsistence farmers and their families may have greater risks of exposure than other people.<sup>132</sup> However, the single greatest threat of human exposure is from polluted groundwater and drinking water sources.<sup>133</sup> The toxins found in coal wastes have been linked to organ disease, increased

cancer, respiratory illness, neurological damage, and developmental problems.<sup>134</sup> Additionally, children who are exposed to coal combustion waste toxins are more likely to experience adverse reactions than adults.<sup>135</sup> In the mid-90s, the EPA estimated that

more than 21 million people, including more than six million children, lived within five miles of a coal-fired power plant,<sup>136</sup> a daunting figure considering that most coal combustion wastes are stored onsite. Pollution has been so bad in some locations that sites were classified as hazardous and drinking water wells had to be closed.<sup>137</sup>

## COAL COMBUSTION WASTES AND THE CHISMAN CREEK SUPERFUND SITE

Located 15 miles northeast of Norfolk, Virginia, the Chisman Creek Superfund Site provides a good example of the hazards posed by coal combustion wastes.<sup>138</sup> More than 25 acres in size, the Chisman Creek property is part of the Chesapeake Bay watershed, including a tributary that drains into the bay.<sup>139</sup> The site was formerly a favorite recreation spot among local residents for fishing, gardening, and riding off-road vehicles.<sup>140</sup> Unfortunately, during a period spanning almost two decades, the site was used as a dumping ground for more than 500,000 tons of fly ash produced at a nearby power plant owned by Dominion Resources.<sup>141</sup>

In 1980, six years after the site was abandoned, local residents noticed changes in the color of

their drinking well water.<sup>142</sup> Testing revealed toxic levels of several metals, including arsenic, selenium, and vanadium, and in 1983 the site was listed as hazardous under the Superfund program.<sup>143</sup> Although Dominion tried unsuccessfully to challenge the listing, cleanup began three years later, starting with extending public drinking water lines to 55 homes and installing a water treatment system.<sup>144</sup> Other cleanup measures included covering and sealing off the fly ash pits and diverting part of the tributary.<sup>145</sup> In 1991 the site was partially rededicated as a local recreation site, but 25 years after Superfund designation there are still restrictions on groundwater use in the area.<sup>146</sup>

A significant factor in coal combustion waste pollution is the lack of stringent federal regulations and safety requirements. In 2000, the EPA reaffirmed a 20 year old decision not to regulate coal combustion wastes as hazardous, choosing to continue side-stepping meaningful protections by classifying them as “special wastes.” One indication of the inadequacy of this approach is that many of these waste facilities continue to operate without any type of lining to prevent leakage, including about half of the landfills and over three fourths of the impoundments.<sup>147</sup> Furthermore, most states do not require

groundwater monitoring, and many do not require waste facilities to obtain state permits.<sup>148</sup>

Unfortunately, this final act in the life cycle of coal does not come to a convenient conclusion. Most coal combustion wastes are stored indefinitely, and may continue to jeopardize the environment and humans for generations to come. Ironically, rather than returning neatly to its buried origins, coal that has passed through this life cycle is in the end converted into something more dangerous—and perhaps longer lasting.