Oaks Bottom Wildlife Refuge Sellwood Dump Detected
Potential Pollutant Risks to Fish and Wildlife and Humans

Pollutant[1]	Fish and Wildlife Risks	Human Risks
Polychlorinated Biphenyls (PCBs) are a group of man-made organic chemicals. PCBs have no known taste or smell, and range in consistency from an oil to a waxy solid. They are often found in electronic equipment such as transformers. They do not readily break down once in the environment. They can remain for long periods cycling between air, water and soil. PCBs can be carried long distances.	Carcinogen with documented impairment of immune systems, reproductive systems, nervous systems, and endocrine systems.	Carcinogen with documented impairment of immune systems, reproductive systems, nervous systems, and endocrine systems.
Barium is a silvery-white metal often used in barium-nickel alloys for spark-plug electrodes an in vacuum tubes as drying and oxygen-removing agent. It is also used in fluorescent lamps. It is used by the oil and gas industries to make drilling mud for lubricating the drill. It is also used to make paint, bricks, tiles, glass, and rubber. Barium nitrate and chlorate give fireworks a green color.	Because of their water-solubility, barium compounds can spread over great distances. When fish and other aquatic organisms absorb them, barium will accumulate in their bodies. Dissolved barium in aquatic environments may represent a risk to aquatic organisms such as daphnids. Daphnia are a preferred prey source by juvenile Coho salmon. But barium is apparently of lesser direct risk to fish and aquatic plants, although data are limited. No adverse effects have been reported in ecological assessments of terrestrial plants or wildlife, although some plants are known to bioaccumulate barium from the soil.	The health effects of barium depend upon the water-solubility of the compounds. Barium compounds that dissolve in water can be harmful to human health. Small amounts of water-soluble barium may cause a person to experience breathing difficulties, increased blood pressures, heart rhythm changes, stomach irritation, muscle weakness, changes in nerve reflexes, swelling of brains and liver, kidney and heart damage. The uptake of very large amounts of barium that are water-soluble may cause paralyses and in some cases even death.
Chromium can enter the environment from a variety of sources including but not necessarily limited to discarded cement, asbestos linings, antifreeze, and certain textiles often found in landfills. Chromium can change from one form to another in water and soil, depending on the conditions present.	Chromium destabilizes ecosystems due to toxic impacts on biota and bioaccumulation in certain organisms. Occurrence of chromium varies in fishes, depending upon their age, development as well as other physiological variables. It can be toxic to cells with detrimental impact on behavior of fish indirectly leading to organ dysfunction and paralysis around the gills. Other affects include anemia (inadequate oxygen to cells), thrombocytopenia (excessive bleeding), decrease in hemoglobin and total red blood cell count (inhibited respiration). At bio-	There are three valences of Chromium: 1) Chromium—safe to humans, 2) Trivalent Chromium—safe and an essential element in humans and 3) Hexavalent Chromium—highly carcinogenic to humans. Hexavalent Chromium has caused a mired amount of suffering and deadly diseases that range from asthma, liver disease, lung cancer, stomach cancer, skin cancer, cardio-vascular disease, as well as many other deadly cancerous effects to external and internal human organs. Hexavalent Chromium

[1] This information was obtained from a variety of sources and no claim is made for or against its validity or relevance to the site conditions present at the Oaks Bottom Wildlife Refuge.

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	chemical level, mostly decline in the contents of glycogen (carbohydrates), lipids and proteins (reduction in energy and nutrition).	cancer clusters can be isolated and identified to specific areas of our environment, such as former Chromium manufacturing sites and unlined dumping sites.
Copper pollution can enter into the environment from discarded products by manufacturing companies dealing with copper in the production of metal, electrical appliances, pesticides, fungicides and other products that contain copper, including but not necessarily limited to used motor oil, paint, and brake pads.	An excess of copper in the water has adverse effects on aquatic life, with damage to freshwater organisms such as fish. Copper damages the kidneys, nervous systems, and livers of most aquatic species. The most sensitive latent effect of exposure to sublethal levels of copper was the failure of copper exposed Coho smolts to migrate successfully following release into a natural stream.	High levels of copper may cause nausea, diarrhea, chest pains, and irritation of the respiratory tract. Very high copper doses can damage the kidneys and liver and may lead to death. There is also a correlation of some aging effects and excess copper.
Iron in leachates from municipal landfills have been detected in concentrations above standards, regardless of site age.	The toxicity of iron depend on the species of the fish, and the size of the fish. The gills of the fish are in effect acting as a mechanical filter, and small particles of iron with dimensions of a few microns are becoming trapped in the gill lamella. The presence of the small iron particles cause irritation of the gill tissues leading to gill damage and secondary bacterial and fungal infections. Iron also will promote the dissociation of oxygen molecules in water to form free radicals. On the surface of the gills, the free radicals formed by the iron can cause oxidation of the surrounding tissue, leading to destruction of gill tissue and anemia.	Iron is not hazardous to health, but it is considered a secondary or aesthetic contaminant. Essential for good health, iron helps transport oxygen in the blood. Most tap water in the United States supplies approximately 5 percent of the dietary requirement for iron. Human exposure to toxic levels of iron are rare and most commonly associated with direct ingestion of high doses of vitamin supplements, especially problematic for children. Skin reactions to exposure from iron laden surface water can moderately damage healthy skin cells.
Lead in leachates from municipal landfills have been detected in concentrations above standards, regardless of site age. House paint and gasoline were once manufactured with lead. Fishing sinkers and jigs are often made from lead. Most fire-arms ammunition contain lead including pellets, shot, slugs, round balls, and bullets.	Lead is a potentially deadly toxin that damages internal organs of the body and can impact all animals, including humans. For both birds and people, lead must be eaten (ingested) or lead particles or fumes inhaled to elevate lead levels to cause poisoning. High blood lead levels (BLL) in birds (from loons, doves, cranes, swans, to vultures, eagles, crows, and other scavenging birds)	Examples of how people can ingest lead include eating paint chips, inhaling paint fumes and paint dust, eating wildlife harvested with lead shot or lead slugs. Stomach acid breaks down lead and then lead is absorbed into the blood stream. Fine particles and fumes that are inhaled are absorbed into the bloodstream through the lungs. Young children and

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	impacts the nervous and circulatory systems and the kidneys. The weakened bird has trouble flying, hunting/feeding, is much more susceptible to infection, and often starves. In female birds with low BLL, reproduction is impacted.	pregnant women absorb more lead than do adult males. In children, even a small amount of lead can cause learning delays, decreased intelligence, shortened attention span, and very high lead levels may cause brain damage or even death. Lead exposure in children may also result in expression of antisocial behaviors. Very low lead levels increase an adult males' risk of stroke and heart attack and can decrease sperm count. Later in life, lead can re-emerge from bone tissue causing high blood pressure, kidney failure, and Parkinson's Disease.
Manganese in a dissolved state can leach through solid waste landfills at concentrations that may be an order of magnitude (or more) greater than concentrations present in natural groundwater systems.	While lower organisms (e.g., plankton, aquatic plants, and some fish) can significantly bioconcentrate manganese, concentrations do not increase with ascending trophic levels of food chains and that predatory animals do not have higher concentrations as they are capable of regulating the manganese content of their tissues by controlled uptake and increased excretion. High manganese ingestion by laboratory animals resulted in an interference with intestinal iron absorption and a subsequent reduction in hemoglobin. This observation is consistent with the anemia seen in other animals including humans. Depending on doses, chemical compositions, and developmental stages of test animals, a host of other disorders were recorded ranging from neurological and behavioral (e.g.., inhibited danger avoidance).	The symptoms of manganese toxicity (usually associated with direct ingestion or inhaled dust) may appear slowly over months and years. Manganese toxicity can result in a permanent neurological disorder known as manganism with symptoms that include tremors, difficulty walking, and facial muscle spasms. These symptoms are often preceded by other lesser symptoms, including irritability, aggressiveness, and hallucinations. Some studies suggest that manganese inhalation can also result in adverse cognitive effects, including difficulty with concentration and memory problems.
Nickel is used to manufacture stainless steel and other nickel alloys with high corrosion and temperature resistance. These alloys are used in ship building, jet turbines and heat elements, cryogenic installations, magnets, coins, welding	Signs of nickel poisoning in fishes include surfacing, rapid mouth and opercular movements and, prior to death, convulsions and loss of equilibrium. Destruction of the gill	Symptoms in rare cases of extreme direct ingestion of sublethal concentrations included nausea, vomiting, abdominal discomfort, diarrhea, giddiness, lassitude,

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rods, electrodes, kitchenware, electronics, and surgical implants; other nickel compounds are used in electroplating, battery production, inks, varnishes, pigments, catalysts, and ceramics. Nickel containing demolished solid wastes are disposed in landfills and to a significant extent are where nickel migrates from out into the food chain through surface water as well as groundwater. Consequently, lethal and sublethal nickel exposure risks to aquatic organisms and humans are increased.	lamellae decreases the ventilation rate and may cause blood hypoxia. Other signs of nickel poisoning in fishes contractions of muscles, signs similar to those associated with hypertension in mammals. Chronic impairment of such a dynamically active and critical organ as the gill may depress the overall fitness of a fish by impairing predator avoidance, prey capture and migration success with obvious environmental implications.	headache, cough, and shortness of breath. Lethal concentrations of ingested nickel have resulted in cardiac arrest and death. Nickel may possibly be carcinogenic to humans.
Silver containing demolished solid wastes are disposed in landfills and to a significant extent are where silver migrates from out into the food chain. Like other metals, silver concentrates in aquatic food chains and may exert toxicity. Surveys show that one-tenth to one third of samples taken from drinking water supplies (both groundwater and surface water) contain silver at levels greater than 30 ppb. The most common way that silver may enter the body of a person near a hazardous waste site is by drinking water that contains silver or eating food grown near the site in soil that contains silver. Silver can also enter the body when soil that has silver in it is eaten. Most of the silver that is eaten or breathed in leaves the body in the feces within about a week. Very little passes through the urine. It is not known how much of the silver that enters the body through the skin leaves the body. Some of the silver that is eaten, inhaled, or passes through the skin may build up in many places in the body.	Silver at specific water concentrations is toxic to zooplankton, marine copepods, and freshwater cladocerans. However if Silver is accumulated from algal food, reproductive success of these organisms is significantly compromised at much lower water column concentrations. Following dietary exposure, decreased egg production and viability occur when tissue silver concentrations increase three- to four- fold. Assimilated silver depresses egg production by reducing yolk protein deposition and ovarian development.	Since at least the early part of this century, doctors have known that silver compounds can cause some areas of the skin and other body tissues to turn gray or blue-gray. Doctors call this condition "argyria." Argyria occurs in people who eat or breathe in silver compounds over a long period (several months to many years). It is likely that many exposures to silver are necessary to develop argyria. Once you have argyria, it is permanent. However, the condition is thought to be only a "cosmetic" problem. Most doctors and scientists believe that the discoloration of the skin seen in argyria is the most likely health effect of silver. But it is not known what level of silver causes breathing problems, lung and throat irritation, or stomach pain in people. Studies in rats show that drinking water containing very large amounts of silver is likely to be life-threatening.
Benzo[*a*]pyrene is a polycyclic aromatic hydrocarbon and the result of incomplete combustion of organic matter. The ubiquitous compound can be found in coal tar, tobacco smoke and many foods. It may also be found in water and soil at landfill sites.	Sediments heavily contaminated m with industrial PAH wastes have directly caused elevated PAH body burdens and increased fish liver neoplasia. Experiments revealed fertilization success but not egg production was significantly decreased in some species	Benzo[a]pyrene metabolites are mutagenic and highly carcinogenic. Numerous studies since the 1970s have documented links to cancers. A 1996 study provided molecular evidence linking components in tobacco smoke to lung

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	of fish, thereby suggesting potential male sensitivity. Specifically, male gonad weight and plasma testosterone concentrations were decreased by 38 and 86%, respectively.	cancer. Exposure to Benzo(a)pyrene can also cause a skin rash, a burning feeling, skin color changes, warts, and bronchitis.
Fluoranthene is a chemical substance formed during the incomplete burning of fossil fuel, landfill garbage, in cigarette smoke, or any organic matter and is found in smoke in general; it is carried into the air, where it condenses onto dust particles and is distributed into water and soil and on plants.	Polycyclic aromatic hydrocarbons, such as fluoranthene are of environmental concern because of their persistence, toxicity, and mutagenic properties. Exposure to approximately 30 ug Flu/g dry-weight sediment or 50 ug Flu/L seawater resulted in significant DNA damage. The degree of DNA damage was time dependent during both exposure and depuration, and although exposure route had no effect on the maximum degree of DNA damage occurring, it did influence the time course of damage. Levels of damage declined despite continued exposure to Flu, providing evidence for the induction of one or more DNA repair mechanisms.	Fluoranthene is reported to alter trophoblast (the placental layer helping to supply nourishment to the fetus) proliferation in placenta, in addition to disturbing its endocrine functions, which may be able to increase the risk of preterm delivery in pregnant women. It is reported to be a human carcinogen. Coal tar pitch volatiles are defatting agents and can cause dermatitis on prolonged exposure. Persons with existing skin disorders may be more susceptible to the effects of these agents.
Naphthalene is used as a fumigant to repel animals and insects in closets, attics, soils (including gardens), and other applications, and also as a deodorizer in diaper pails and toilets. Outdoors, it is used to control nuisance vertebrate pests (snakes, squirrels, rats, rabbits, bats, *etc.*) around garden and building peripheries. Many building materials emit naphthalene. It is a commonly used material in carpet pads and other flooring materials. These materials are all commonly found in municipal landfills. The detection of naphthalene in groundwater in the vicinity of industrial facilities and indicates that these chemicals are released to water from these sources.	It is likely that loss of naphthalene from ambient water occurs by volatilization. It is expected to be slightly mobile to immobile in soils Methylnaphthalene in are also excreted rapidly by fish and shellfish when they are removed from polluted waters. Reported biodegradation half-lives range from 3 to 1,700 days in various water systems. It can persist in anaerobic soil for much longer time frames.	Naphthalene is a possible human carcinogen but available data are inadequate to establish a causal association Existing exposure data are limited, and monitoring surveillance should be improved. Naphthalene was also detected in six of eight samples of human milk.
Phthalates are used as plasticizer additives to make materials more flexible and malleable. They are bonded physically, not chemically, to the polymeric matrix and can migrate to and leach from the product surface, posing a serious danger to the	Early investigations on annelids and mollusks focused on bioaccumulation (phthalates bioconcentrate in fish) and acute toxicity of phthalates, but more recently, wider biological effects have been shown,	The main concerns of human and wildlife exposure to Phthalate are the potential adverse effects on reproduction, including problems with fertility, the development of newborns, and carcinogenicity. It can

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environment and human health. There have been a number of studies on Phthalate concentrations in landfill leachate.	including mitotic inhibition, induction of chromosomal aberrations and effects on larval development. Exposures to phthalates alter behavior in fish such as alterations in shoaling and feeding behavior in three-spined stickleback and common carp.	enter the human body through inhalation, ingestion and dermal absorption and can potentially affect human testicular dysgenesis syndrome, reproductive development and sex reversal. Phthalates acting as endocrine disruptors may contribute to many health problems such as hepatomegaly, osteoporosis, feminization of boys, weight loss, and skin and breast cancer. Because it can bioaccumulate over long term exposure, humans are at higher risk following continued consumption of contaminated water or food.
DDT (dichlorodiphenyltrichloroethane) is a pesticide once widely used to control insects in agriculture and insects that carry diseases such as malaria. DDT is a white, crystalline solid with no odor or taste. Its use in the U.S. was banned in 1972 because of damage to wildlife. DDE dichlorodiphenyl-dichloroethylene) and DDD (dichlorodiphenyldichloroethane) are chemicals similar to DDT and are also major metab-olites and environmental breakdown products of DDT. DDT and its derivatives are persistent organic pollutants that are readily adsorbed to soils and sediments and which can act both as sinks and as long-term sources of exposure to organisms.	In animals, short-term exposure to large amounts of DDT in food affected the nervous system, while long-term exposure to smaller amounts affected the liver. Also in animals, short-term oral exposure to small amounts of DDT or its breakdown products may also have harmful effects on reproduction. Historically, The chemical and its breakdown products DDE and DDD caused eggshell thinning and population declines in multiple North bird of prey species. DDE-related eggshell thinning was once considered a major reason for declines of the bald eagle, brown pelican, peregrine falcon and osprey. These species are now recovering since the chemicals were made illegal to use.	DDT affects the nervous system. People who accidentally swallowed large amounts of DDT became excitable and had tremors and seizures. These effects went away after the exposure stopped. Women who had low amounts of a form of DDE in their breast milk were unable to breast feed their babies for as long as women who had high amounts of DDE in their breast milk. Women who had high amounts of DDE in the blood had an increased chance of having premature babies. Mothers with high levels of DDT circulating in their blood during pregnancy were found to be more likely to give birth to children who would go on to develop autism.
The physicochemical properties of **DDT** and its metabolites **(Total DDT**) enable these compounds to be taken up readily by organisms. High lipid solubility and low water solubility lead to the retention of DDT and its stable metabolites in fatty tissue. The rates of accumulation into organisms vary with the species, with the duration and concentration of exposure, and with environmental conditions. The high retention of DDT metabolites means that toxic effects	Both the acute and long-term toxicities of DDT vary between species of aquatic invertebrates. Early developmental stages are more sensitive than adults to DDT. Long-term effects occur after exposure to concentrations ten to a hundred times lower than those causing short-term	Women who had high amounts of DDE in the blood had an increased chance of having premature babies. Mothers with high levels of DDT circulating in their blood during pregnancy were found to be more likely to give birth to children who would go on to develop autism.

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can occur in organisms remote in time and geographical area from the point of exposure..	effects. DDT is highly toxic, in acute exposure, to aquatic invertebrate, at low concentrations. Toxic effects include impairment of reproduction and development, cardiovascular modifications, and neurological changes. Daphnia (a primary prey of juvenile Coho) reproduction is adversely affected by DDT at 0.5 µg DDT/litre.	