

Migratory Bird Mortality in Oilfield Wastewater Disposal Facilities

Wyoming Ecological Services Field Office - Environmental Contaminants Program

Commercial and centralized oil field wastewater disposal facilities (COWDFs), pose a significant risk to migratory birds and other wildlife because they use large evaporation ponds (either passive or with aeration) to dispose of and treat oil and gas exploration and production wastes. An estimated 500,000 to 1 million birds are lost annually throughout the United States in oil field production skim pits and COWDFs.



Oilfield wastewater disposal facility. USFWS/Pedro Ramirez, Jr.

Wastewater in COWDFs is initially discharged into a receiving pit to separate the oil from the water. The greatest amount of oil tends to float to the surface in the skim pit. Water from receiving pits is often sent to another pit or series of pits for evaporation or other management. COWDFs are typically regulated by state agencies with oversight by the U.S. Environmental Protection Agency primarily under the Oil Pollution Act and the Resource Conservation and Recovery Act. Migratory birds are protected by the Migratory Bird Treaty Act. Companies may be held liable should migratory bird mortalities occur in COWDFs or oil pits.

Oil, Sheens & Hydrocarbons

Oil on the surface of evaporation ponds can entrap birds. Birds can also ingest toxic quantities of oil by preening their oil-covered feathers. Oil also damages the insulation provided by feathers. Visible sheens on ponds are just as

deadly to birds that come into contact with them. A light sheen will coat the bird's feathers with a thin film of oil. Although a sheen of oil on the bird may not immediately immobilize the bird, it will compromise the feathers' ability to insulate the bird. The affected bird will ingest the oil when it preens its feathers and suffer chronic effects. The bird could suffer mortality depending on the severity of the chronic effects and the amount of oil ingested. Mortality or morbidity may result depending on the amount of oil coating the animal, the species, prior condition of the animal, the amount of stress incurred by the animal after oiling, and weather conditions.

Oily sludges soaked into the dike can seep back onto the pond surface, especially during the summer when warm temperatures can mobilize the oil. Rainfall events or snowmelt will wash oil from the dike back into the pond.

Salt Toxicity

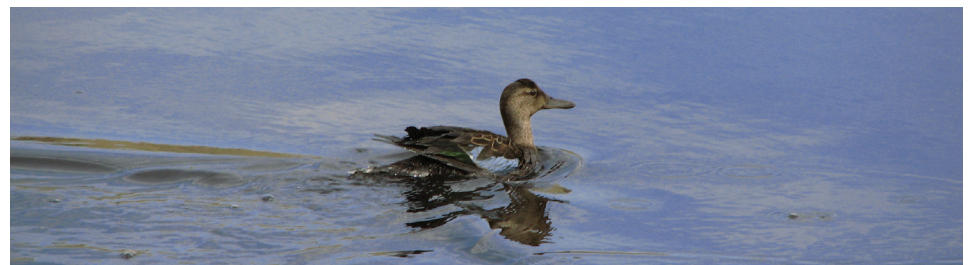
Birds using COWDF ponds with hypersaline water can ingest the brine and die from sodium toxicity or can suffer chronic effects especially if a source of freshwater is not available nearby. Birds preening the salt crystals off their feathers can ingest the salt (as little as 4 grams of salt can be lethal to birds). During cooler temperatures, sodium crystallizes on the feathers of birds landing in these

ponds. The sodium crystals destroy the feathers' thermoregulatory and buoyancy functions causing the bird to die of hypothermia or from drowning. Sodium intoxication can cause neurological impairment resulting in the bird's inability to hold its head upright. The bird's head will droop into the water and cause it to drown.

Surfactants and other chemicals

If the evaporation pond is receiving produced water from oil or natural gas wells, oil and gas production chemicals, such as corrosion inhibitors and surfactants, could be present in the wastewater and could pose a risk to migratory birds. Extreme pH in the wastewater can also adversely affect birds landing on the evaporation ponds. Surfactants (i.e. soap) are used to free oil or gas from the reservoir rock formation.

When a bird comes into contact with water containing surfactants, the surfactant will reduce the surface tension of the water; thus, allowing water to penetrate through the feathers and onto the skin. This compromises the insulation properties of the feathers and subjects the bird to hypothermia. The loss of water repellency by the feathers due to reductions in surface tension will cause the bird to become water logged and the loss of buoyancy will cause the bird to drown.



Oil-covered blue-winged teal in COWDF evaporation pond. USFWS/Pedro Ramirez, Jr.



Surfactants in evaporation ponds can cause bird mortality. USFWS/ Pedro Ramirez, Jr.



Eared grebe with salt crystals on feathers. Hypersaline evaporation ponds can result in bird mortality due to salt toxicity. USFWS/ Pedro Ramirez, Jr.



Oil-covered elk calf found at edge of COWDF evaporation pond. USFWS/ Pedro Ramirez, Jr.



Grebes and ducks recovered at COWDF evaporation pond. USFWS/ Pedro Ramirez, Jr.

Solving the Problem

Solutions to migratory bird mortality at COWDFs are fairly simple and straight forward.

- Use Closed Containment Systems - Closed containment systems should be used to store oil at COWDFs. Closed containment systems eliminate soil contamination and remediation expense.
- Keep Oil Off Open Ponds – COWDFs should be designed to prevent oil from entering evaporation ponds. A contingency plan should be developed for the facility to ensure immediate clean up of oil discharged into the evaporation pond to prevent wildlife mortalities.
- Use Effective & Proven Wildlife Deterrents or Exclusionary Devices – If open-topped tanks or pits will be used to store oil at the facility, effective wildlife exclusionary devices should be installed to prevent wildlife mortality. Netting appears to be the most effective method of keeping birds from entering wastewater evaporation ponds and skim pits. Flagging is not an effective deterrent.
- Implement Engineering Controls to Prevent Oil Discharge to Evaporation Ponds – Engineering controls should be designed and implemented to prevent the discharge of wastewater containing oil and surfactants into the evaporation pond.
- Dispose of Oil Field Wastewater by Deep Well Injection – Deep well injection of oil field wastewater eliminates the need for evaporation ponds.



Evaporation pond with oil on surface. USFWS/ Pedro Ramirez, Jr.

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