Lasting Oil Spill Impacts in Coastal Wetland

Although evidence of the 2010 Deepwater Horizon (DWH) oil spill may not be visually obvious today, crude oil can still be found in Louisiana coastal marshes. Oil not initially degraded has become buried under the yearly pile of dead plant material, which is deposited after each growing season. The oil has potential to cause stress to plants, as it is buried and in close proximity with the roots.

A paper recently published in the *Soil Science Society of America Journal* investigates how the presence of surface and buried crude oil under flooded and drained conditions affects the redox of wetland soils, an important control of wetland soil functions.

Researchers reported that reduction potential of the wetland soil was not significantly different under flooded conditions, mimicking high-tide conditions. However, under drained conditions, similar to low tide, oil slowed the transport of oxygen into the root zone. This delay in oxygen availability caused by oil can increase stress on wetland plants unable to supply enough oxygen to their root system. This stress can contribute to accelerated loss of marsh area through erosion in a region where marshes are already rapidly disappearing, due to high relative sea level rise.


Measured Soil Moisture Improves Wildfire Prediction

Despite the known connection between soil moisture and wildfire danger, measured soil moisture is conspicuously absent from the list of variables commonly used in wildfire danger assessments. Instead, assessments enlist the help of the decades-old Keetch-Byram Drought Index (KBDI), a soil moisture surrogate calculated from precipitation and estimated evapotranspiration. In the absence of measured soil moisture data, the reliance upon KBDI as a surrogate to assess wildfire danger is understandable. But is the continued reliance on KBDI justified when high quality soil moisture data are available?

According to recent work published in *Soil Science Society of America Journal*, the answer is no. Researchers in Oklahoma compared the relationships of measured soil moisture, as fraction of available water capacity (FAW), and KBDI with wildfire occurrence statewide and found that FAW consistently outperformed KBDI. Soil moisture conditions conducive to large growing-season wildfires were more narrowly defined by FAW, regression models based on FAW correctly classified days with large fires at a higher rate, and FAW provided earlier warning of extreme wildfire potential. Based on these findings, the authors call for the replacement of KBDI with FAW in growing-season wildfire danger assessments in Oklahoma and regions with similar climate and vegetation types.


Crude oil from the BP spill can still be found buried in the wetland soils. Surface of the soil is at the top, and the oil can be seen as a line of reddish-brown material running horizontally about 5 cm below the surface.

Smoke and pyrocumulus cloud from a 2,800-ha fire that destroyed 23 homes near Stillwater, OK in August of 2012. Fraction of available water capacity (FAW) at the time of the fire was only 0.10, or 10% of its possible maximum value, and Keetch–Byram Drought Index (KBDI) was 744. This extremely low soil moisture desiccated herbaceous and woody vegetation (photo foreground), leading to increased wildfire probability. Photo by J.D. Carlson.