ASSESSING SOIL ECOSYSTEM RECOVERY FOLLOWING MANAGED AND UNMANAGED BIOREMEDIATION OF A CRUDE OIL SPILL

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In 1999 a pipeline break resulted in a spill of approximately 70 bbl of dewatered crude oil in the Tallgrass Prairie Preserve in Osage County, OK. The immediate effect of the spill was contamination of a 10,000 ft^2 area of once-pristine, tallgrass prairie grassland on a gentle slope. However, as crude oil flowed over the site it ultimately entered a lease road where it continued to flow in a gulley until re-entering pristine prairie again about 100 yd away. An additional 6000 ft^2 of grassland was contaminated before the pipeline could be isolated and the spill stopped. As expected the larger impacted site also had the highest initial TPH concentration, about 33,500 mg/kg when remediation was initiated. The smaller secondary site had an initial TPH concentration of about 4800 mg/kg.

These sites have been used to study the effect of managed (with fertilizer addition) and unmanaged (without fertilizer addition) bioremediation on the ultimate restoration crude oil impacted grassland. Both of the impacted sites were divided in half with buried corrugated plastic sheeting to isolate the fertilized (downslope) and unfertilized sections. Both sections of both sites currently have TPH concentrations of less that 1000 mg/kg although in the primary site more time was required to reach these levels in the unmanaged section. Presently all sections of the two sites are revegetated. During both the remediation and restoration phases of this project the soil ecosystems have been monitored in both sections of both sites in terms of soil microbiology, nutrients, and nematode populations. These ecological indicators have been compared to both pristine prairie and an unimpacted (by oil), but tilled, control. These studies have shown that the lack of fertilizer caused disruptions in the soil nutrient pool which have slowed the recovery of the soil ecosystem. In this paper we have used aboveground plant biomass and plant species diversity as ecological indicators to determine if significant differences still exist.