Vegetation Recovery After a Hurricane and Crude Oil Spill Response in a Bahamian Caribbean Pine Forest

Andrew Graham[1], Travis Scott[1], Samantha Iliff[1], Hanne Greiff Johnsen[2], Lars Petter Myhre[2], Tanya Rigby Seymour[3]

[1]Polaris Applied Sciences, Inc. Kirkland, WA

[2]Equinor ASA, Norway

[3]Equinor ASA, Texas

On 1 September 2019, Hurricane Dorian impacted Grand Bahama Island with 185 mph winds which damaged the roof coverings on 5 storage tanks at the South Riding Point tank farm and released an estimated 55,000 bbls of crude oil into the surrounding environment. The oiled areas consisted of over 760 hectares of Caribbean pine forest adjacent to the tank farm. Response treatment methods were selected with the objectives that any remaining oil should not pose a contact threat to wildlife nor limit the forest's ability to recover naturally. These treatment methods included the vacuum recovery of free phase oil, removal of oil saturated sediments, absorption of thick and sticky oil with natural adsorbent, clipping of heavily oiled vegetation, and collecting heavily oiled loose organic matter. New vegetation growth along with thin and weathered oil on substrate or vegetation was recommended to be left in place to naturally degrade. No treatment was recommended for the interiors of wetlands found within the forest; however, limited cutting and raking of oiled vegetation and debris was completed along the wetland edges. To prevent treatment from inhibiting natural attenuation, No Further Treatment (NFT) guidelines, or treatment "endpoints" were developed to give Operations understandable, visual goals allowing them to determine when treatment was complete. These NFT guidelines included: no free phase oil, no oil-saturated soil, no heavily oiled vegetation that represents a transfer risk to wildlife, no oiled debris, and some coat-stain may remain if it does not easily transfer.

To help document the treatment effectiveness and recovery, and to help differentiate between effects of the hurricane versus the oil spill, photo-monitoring stations were established, and a long-term vegetation monitoring plan was developed and implemented. Nineteen photo-monitoring stations were set up, and photographs were taken from the same location at each station approximately monthly during the response. The vegetation monitoring plan consisted of measuring percent vegetation cover, species richness, and species diversity at 10 forest plots located in areas that were unoiled, heavily oiled with treatment, and heavily oiled without treatment. Spartina stem counts were also conducted at 12 wetland plots in locations that were unoiled and oiled without treatment. Vegetation assessments have been conducted at 2-, 5-, 17-, and 29-months post-incident, with the most recent assessment in February 2024 at 54 months post-incident. A final vegetation assessment is planned for February 2029, 114 months post-incident. Results from the recent assessment show percent vegetation cover increased at a similar rate between the unoiled and heavily oiled vegetation plots, both with and without treatment. Species richness and species diversity increases were also similar between the unoiled and heavily oiled with treatment plots; however, these increases were not observed in the heavily oiled without treatment plots. Stem counts in the wetland plots showed no significant difference in the recovery of the oiled versus unoiled plots. These results indicate the selected treatment methods and objectives helped the heavily oiled forest to recover similarly

to the unoiled forest, and possibly faster and more substantially than if no treatment had occurred.