In Situ Burning of Spilled Oil in Inland Regions of the United States

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Why Burn? - Advantages

- Rapid removal of large amounts of oil
- Much less oil left for disposal
- High efficiency rates (up to 98-99%)
- Less equipment and labor required
- May be only viable option (marshes, ice)
Disadvantages

• Large black smoke plume
• Heavily emulsified oils do not burn (not typical for inland spills)
• Minimum thickness needed for oil to ignite
• Risk of fire spreading (safety)
• Burn residue can be difficult to recover (may sink from burns of very heavy oils)
Considerations for Use

• **SAFETY**
  – protect workers and public

• Ignition

• Plant and soil moisture
  – high moisture desirable

• Season
  – winter best, early summer worst

• Weather conditions
  – Low, steady winds; no weather fronts or storms
  – No atmospheric inversion to trap smoke

• Residue collection
Burn from Hurricane Spill
North Dakota Crude Burn
North Dakota Spill after Burn
Ignition with Propane Torch
Resulting Fire
Moisture Protects Oiled Marsh
Burned Area Much Larger Than Spill
Recovery After 21 Months
Jet Fuel Burn in Marsh
Ignition with Pad Soaked in JP-5
Snow and Ice Protects Plants
Immediately Post Burn
Residue
One Year Later (early spring)
Two Years Later
Diesel Spill in Marsh & Mud Flats
Ignition with Propane Torch
Ignition with Flare
Utah Site after Burn
Utah Site Recovery after 1.5 Years
Condensate Spill in Salt Marsh
Sorbents were Inadequate
Mosquito Bay Burn
Fire Spreading Beyond Oiled Area
Burned Area Much Larger Than Spill
Mosquito Bay Recovery
Cohasset Crude Oil Burn
US Forest Service Applying Flame Retardant to Prevent Fire Spread
Ignition with Flare Gun
Fire Spreads Slowly
Fire Getting Larger
Fire Fully Involved
White Fire Retardant on Trees
Fire Only Burned Oiled Area
Moisture Protected Roots
Air Inversion Causes Smoke to Fill Sky
Air Quality Concerns Result
Emissions

• Soot is only real problem (10-15% of oil burned) and consists of carbon with other contaminants in ppm range
• VOC’s are consumed by fire and are less than if oil left to evaporate
• PAH’s are lower in soot and residue than original oil
• Metals and sulfur compounds are very low
• Within 500 meters downwind, ground concentrations less than 150 μm/m³
Combustion Components

- Carbon Dioxide (73%)
- Water Vapor (12%)
- Particulates (10%)
- Carbon Monoxide (3%)
- Sulfur Dioxide (1%)
- Other (less than 1%)
Residue Pickup
Digging a New Pond
Final Cleanup Created Pond

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Crude Oil Burn in Pond/Wetland
Tarry Residue Picked Up in Sheets
Recovery One Year later
Summary

- In-Situ Burning is a useful cleanup method for inland oil spills
- Safety of the burn is paramount
- Weather and season must be considered
- Moisture is needed to prevent the fire from spreading and to protect the plants
- Ignition is “easy”
- Burn residue may still have to be recovered or treated (bioremediation)