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

David Fritz

Crisis Management Coordinator

BP America

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

Site after Burn

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

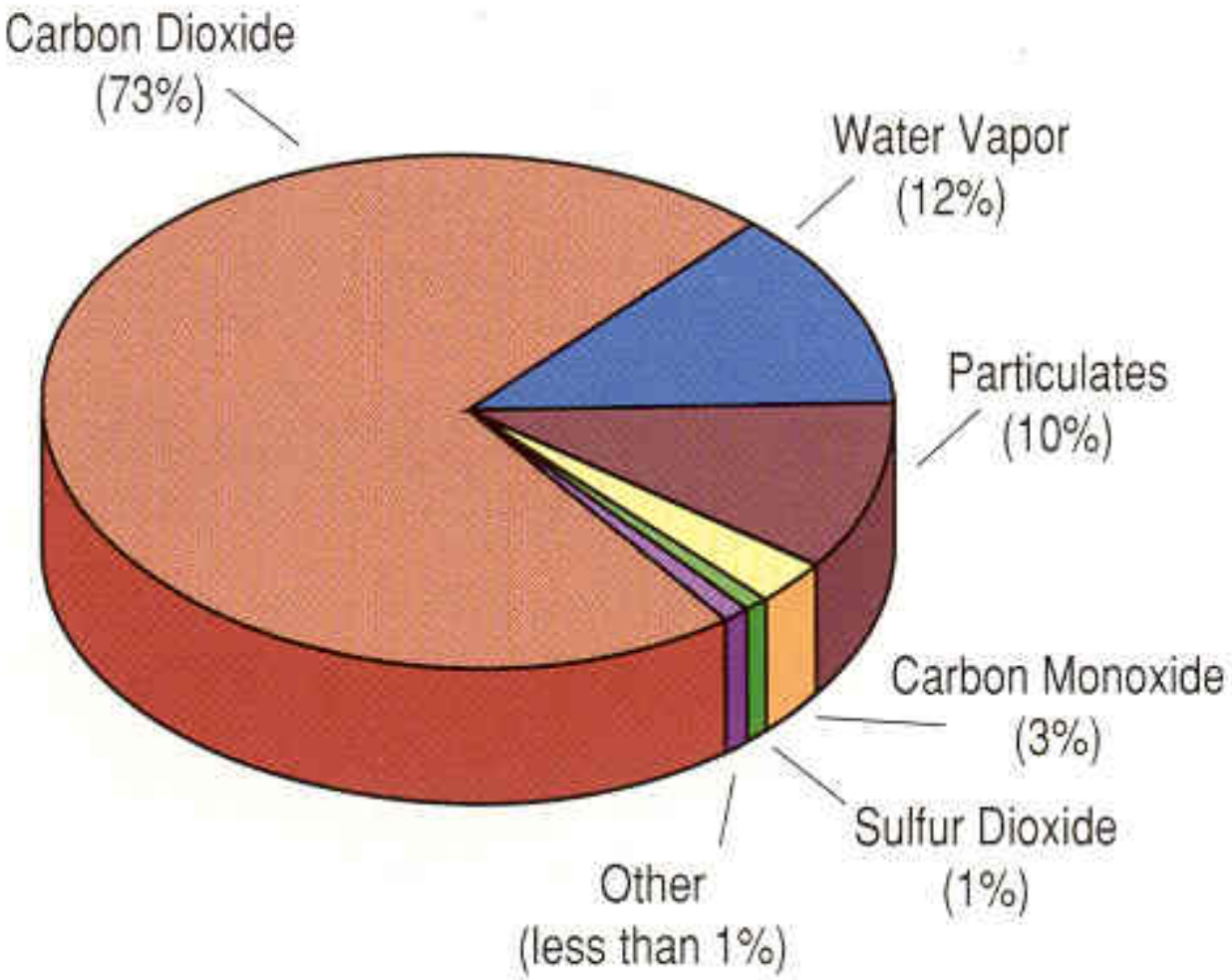
Air Inversion Causes Smoke to Fill Sky

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 $\mu m/m^3$

Combustion Components



Residue Pickup

Digging a New Pond

Final Cleanup Created Pond

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)