THE ROCKEFELLER REFUGE OIL SPILL: A TEAM APPROACH TO INCIDENT RESPONSE

Thomas J. Hess, Jr.
Louisiana Department of Wildlife and Fisheries
5476 Grand Chenier Highway
Grand Chenier, Louisiana 70643

LCDR Ilene Byron
National Oceanic and Atmospheric Administration
8TH Coast Guard District (MSFC)
501 Magazine Street
New Orleans, Louisiana 70130-3396

Heather Warner Finley
Louisiana Department of Wildlife and Fisheries
P.O. Box 98000
Baton Rouge, Louisiana 70898-9000

Charles B. Henry, Jr.
Institute of Environmental Studies
Louisiana State University
Room 42 Atkinson Hall
Baton Rouge, Louisiana 70803

ABSTRACT: *Rockefeller Refuge staff identified a potential petroleum pipeline leak on the evening of March 13, 1995. Approximately 40 barrels of condensate oil (API Gravity 40-42) and minimal produced water leaked from the pipeline, affecting 50 acres of brackish marsh. It soon became evident that vehicular traffic, human ingress, and mechanical cleanup procedures were negatively impacting the marsh. Refuge personnel made a verbal request to the United States Coast Guard to apply an in-situ burn to the spill-affected area. A tremendous cooperative effort between industry, state, and federal agencies ensued on March 17, 1995, to develop and implement a written burn plan. Regional Response Team VI approved the burn plan at 2:30 P.M., and the burn was applied to the area at 3:00 P.M. By 5:30 P.M. the in-situ burn had removed condensate oil from approximately 20 acres of spill-affected marsh.*

An oil spill occurred from a Superior Offshore Pipeline Company 16-inch pipeline owned by Mobil Exploration and Producing U.S. Inc. at Rockefeller Refuge, Cameron Parish, Louisiana (Figure 1) on March 13, 1995. Approximately 40 barrels of condensate oil (API Gravity 40-42) and minimal produced water leaked from the pipeline, affecting approximately 50 acres of brackish marsh (Henry, 1996). The spill occurred in an environmentally sensitive area that is considered "one of the most important wildlife areas in the United States" (Joanen *et al*., 1969). Rockefeller Refuge, deeded to the state of Louisiana in 1920, encompasses 76,000 wetland acres. The area serves as a migratory waterfowl wintering area and functions as a natural laboratory for research on "marsh management, plant ecology, pond culture and life history studies of many forms of fish and wildlife found on the refuge" (Joanen *et al*., 1969; Wicker *et al*., 1983).

Spill response

A Rockefeller Refuge staff biologist, conducting an air boat wildlife survey, reported a potential leak problem in the Price Lake Management Unit the evening of March 13, 1995. The Price Lake Management Unit is a controlled estuarine water management unit characterized as brackish marsh and located in the southwest portion of the refuge. Water levels and salinities are controlled by two 5-barrel, aluminum, stop-log flap-gate water control structures (Figure 2).

Inclement weather and site remoteness precluded site inspection the night of March 13, 1995. However, Rockefeller Refuge staff alerted Mobil to a potential pipeline leak the night of March 13, 1995, and transported a Mobil representative to the suspected leak site the morning of March 14, 1995. Shut-in and emergency notification procedures were initiated from the spill site at 10:00 A.M. by cellular telephone. Larco Environmental Services, Inc., an oil spill and hazardous material emergency response service, and Crain Brothers, Inc., an oil field construction contractor, were dispatched to the site for spill cleanup and pipeline repair assessment. An incident command post was established approximately 2 miles east of the spill site at Joseph Harbor on March 15, 1995. Larco and Mobil personnel assumed incident command responsibilities; refuge personnel acted as advisors to the incident command; the Louisiana Oil Spill Coordinator's

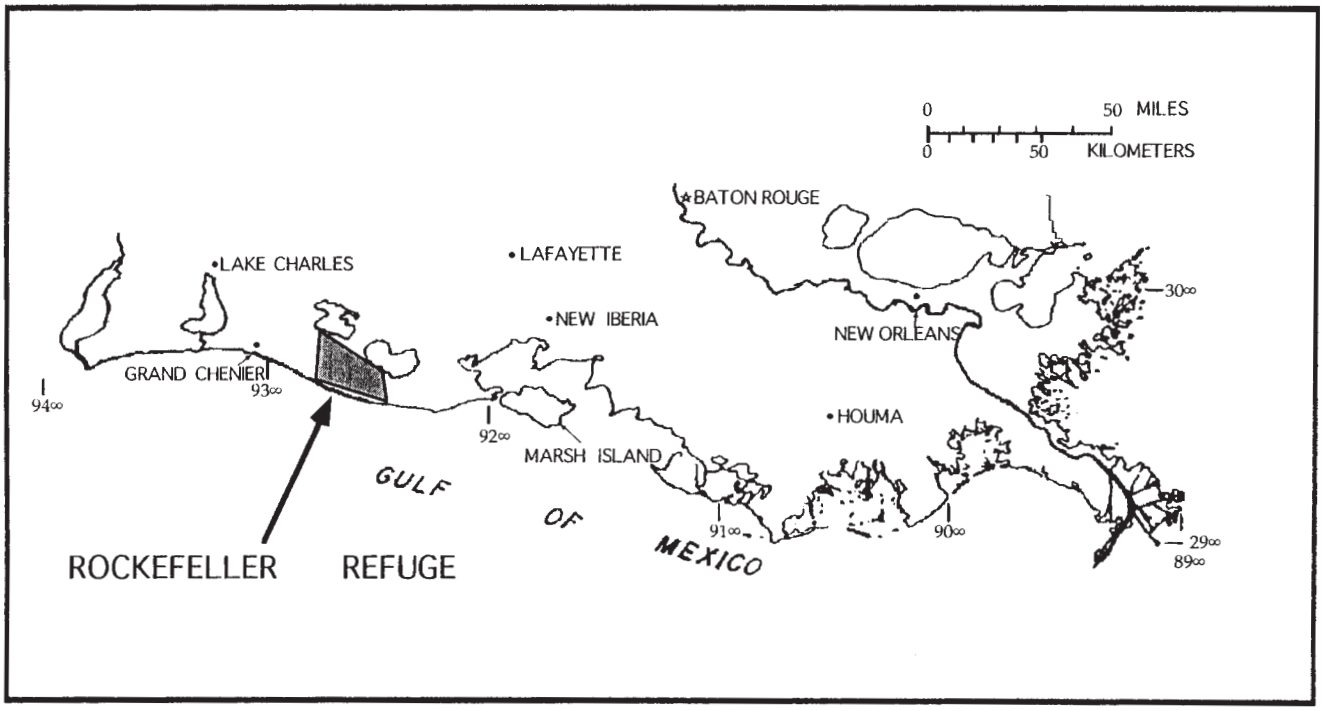

Figure 1. Map of coastal Louisiana identifying Rockefeller Refuge, Cameron Parish, Louisiana

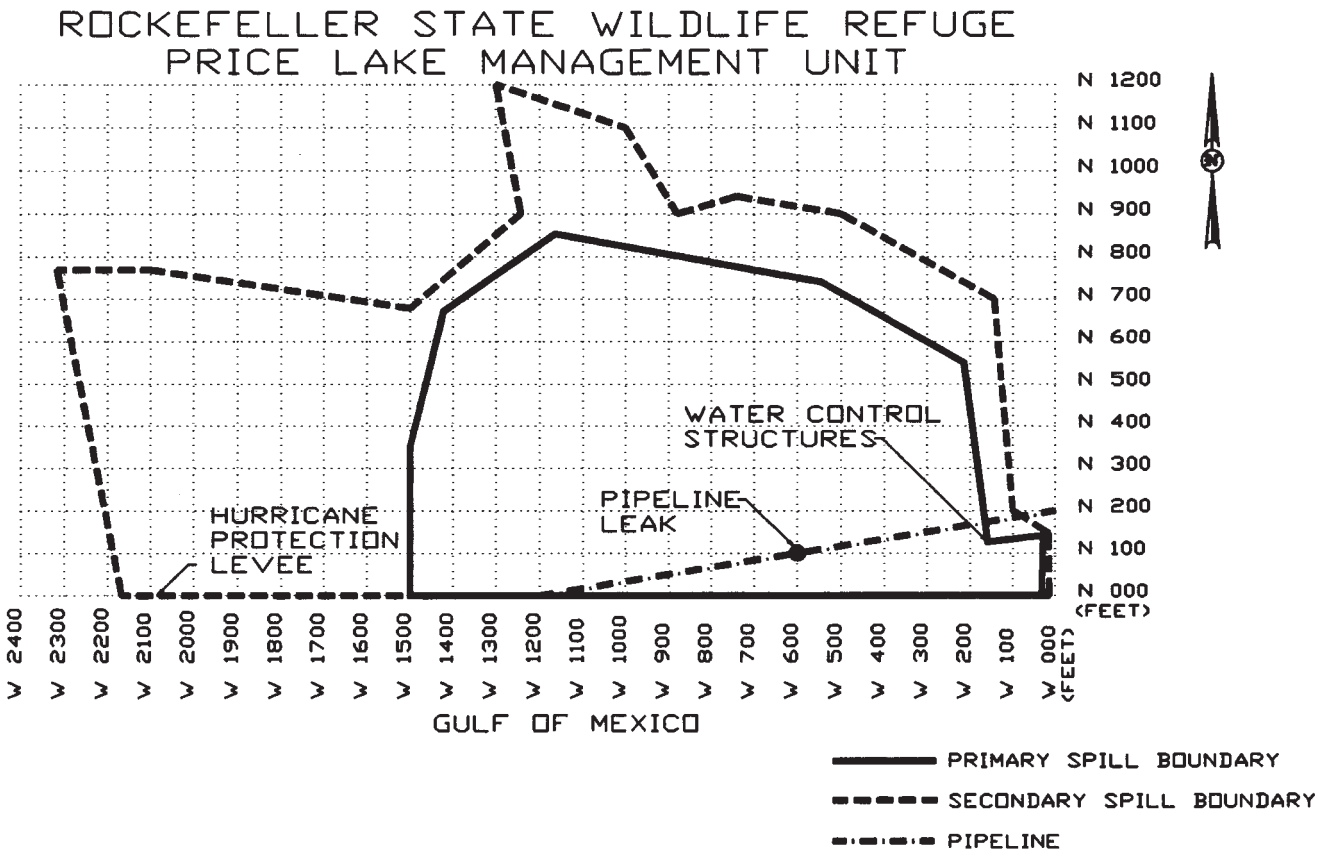

Figure 2. Map of pipeline leak at Price Lake Management Unit, Rockefeller Refuge, Cameron Parish, Louisiana

Office (LOSCO) represented the state of Louisiana; and the U.S. Coast Guard (USCG) assumed federal on-scene command (FOSC) duties.

Site assessment

Mobil, Rockefeller Refuge, Larco, and Crain Brothers personnel began to cooperatively develop a response strategy that would minimize both spill and response impacts. The incident presented many logistical problems. The spill site was approximately 5 miles from a major highway and 2 miles from a navigable waterway; access was limited to air boats and marsh buggies.

The pipeline leak occurred in a densely vegetated marsh area adjacent to a hurricane protection levee that serves as the Price Lake Unit southern boundary (see Figure 2). The spill had little impact on wildlife and fisheries resources. Immediate boom deployment was recommended to control product migration to aquatic pond areas used by estuarine organisms and waterfowl north of the spill site.

Refuge personnel were concerned that pipeline repair activities could compromise the hurricane protection levee integrity and allow salt water intrusion into the area. They established traffic routes to minimize vehicular damage to sensitive wetland areas surrounding the spill site. Rockefeller Refuge, Mobil, and Larco personnel were trained spill responders with field experience. The presence of experienced on-scene field personnel expedited the assessment process and facilitated development of an efficient cleanup plan.

Spill cleanup methods

Mechanical. Cleanup contractors began marsh boom deployment, and the USCG assessed the spill site the evening of March 14, 1995. USCG personnel agreed with the response plan, and approximately 4000 feet of 6-inch boom was used to surround the spill-affected area. Boom deployment was a tedious process, since all boom was set on foot to minimize mechanical impacts to the marsh. Portable skimmer pumps and a large marsh buggy-mounted vacuum pump (Figure 3) were used to skim condensate from barrow pits along the hurricane protection levee. Approximately 600 feet of sorbent boom and sorbent pads were also used to collect condensate. After 2 days it became evident that vehicular traffic, human ingress, and mechanical cleanup procedures were negatively impacting the marsh. Air boats, marsh buggies, and cleanup workers were causing more environmental damage than the spill (Figure 4). As the incident unfolded, the responders realized that the marsh booms were ineffective in containing the condensate. Fontenot (1995) reported that less than 10 barrels of condensate was recovered in 7 days. Dense vegetation and inadequate water depths allowed condensate to seep under booms.

Refuge personnel advised the incident command to map the spill (see Figure 2). A primary spill boundary identified condensate that visually coated the water surface between marsh vegetation. A secondary boundary was established denoting condensate sheen (Fontenot, 1995). Spill mapping showed that condensate was migrating toward sensitive marsh pond areas used by wildlife.

In-situ burning. Burning is an accepted marsh management practice at Rockefeller Refuge. Approximately one-third of the refuge is burned annually to promote vegetative vigor, remove litter, and protect against unwanted lightning fires. Marsh burning was considered an "unforgiveable sin" along the Louisiana and Texas Gulf of Mexico coast prior to 1910, but was a common practice by 1926 (Hoffpauer, 1967). Lynch (1941) identified marsh burning as an effective marsh management tool in Gulf Coast marshes.

Mobil personnel recommended in-situ burning as a spill response option during the early stages of incident response. However, refuge and Larco personnel did not want to present this spill response option to the FOSC until all available mechanical cleanup methods had been used. Refuge personnel were also concerned that the spill-affected area did not have enough dry grass and litter to carry a fire, since the area had burned by lightning strike the previous August. All agreed that the condensate and marsh would burn and that in-situ burning would be appropriate after mechanical spill cleanup methods proved ineffective.

Although on-scene field personnel were trained spill responders, no one knew the procedure to gain burn approval. Refuge personnel took the lead and contacted the USCG for guidance. The USCG referred refuge personnel to the National Oceanic and Atmospheric Administration (NOAA) scientific support coordinator (SSC). The SSC advised that a written plan had to be submitted through the USCG FOSC to Regional Response Team VI (RRTVI) for final approval. On-scene field personnel were disappointed that prompt verbal burn approval could not be

Figure 3. Marsh buggy-mounted skimmer pump used to skim condensate from barrow pits at the Rockefeller Refuge oil spill, Cameron Parish, Louisiana

Figure 4. Environmental damage caused by spill response equipment at the Rockefeller Refuge oil spill, Cameron Parish, Louisiana

secured and assumed that a formal written request would become lost in bureaucratic reviews. Refuge and Mobil staff pursued the development of a plan but felt that regulators would take a cautious approach to burn approval and that the window of burn opportunity would be missed.

A meeting was scheduled for the morning of March 17, 1995, for Rockefeller Refuge staff, Mobil staff and consultants, spill response contractors, the USCG, the SSC, the Louisiana Department of Environmental Quality, and LOSCO with the objective of writing a burn plan to submit for approval. The SSC advised refuge staff to prepare a preliminary spill assessment the night before the meeting. Although no in-situ burn guidelines existed for Louisiana, the SSC sent relevant reference materials to refuge staff by facsimile. Refuge personnel developed a preliminary assessment that included the following in-situ burn justifications:

1. Cleanup personnel could not remove condensate from the vegetated marsh using conventional methods.
2. Forecasted rain could cause condensate to migrate to environmentally sensitive aquatic areas and further limit the window of opportunity.
3. Prescribed burning is an accepted wildlife management practice in coastal Louisiana.
4. Wildlife contamination by condensate was imminent.
5. Water levels, approximately 2 to 4 inches above the marsh floor, would buffer plant root damage from heat.

An informal meeting was held between refuge staff and the SSC before the formal burn plan meeting. Refuge staff and on-scene responders were concerned that they did not have the time or expertise to write a formal plan to gain burn approval in a timely fashion. The SSC agreed that burning was a viable spill response option for this incident and assured refuge personnel that the necessary resources and personnel were available to gain formal written burn approval.

A tremendous spirit of cooperation between the landowner, industry, and state and federal regulatory agencies began at this point. The formal burn plan meeting was called to order, and the preliminary spill assessment was presented by refuge staff. All parties present at the meeting agreed that an in-situ burn was appropriate. Burn plan guidelines were developed to ensure public safety and response personnel safety and to ensure compliance with all state and federal regulations. Air quality guidelines followed regulations set forth in the Louisiana Administrative Code, Title 33:III.1109. Meeting participants also discussed the opportunity to develop a research plan to collect preburn reference samples, conduct preburn vegetative sampling, and monitor recovery. Henry (1996) reported that "*in-situ* burning of oil spilled in marshes has been used several times over the last few years as a response and mitigation method, yet few studies have actually been conducted to evaluate the efficacy of the treatment in relationship to ecological tradeoffs and marsh recovery."

Meeting participants developed a formal burn plan in 4 hours and submitted the plan to the USCG FOSC for initial approval. The USCG then forwarded the plan to members of RRTVI, which included representatives from the U.S. Environmental Protection Agency, the U.S. Department of Commerce, the U.S. Department of Interior, and LOSCO. In-situ burn approval was granted. A USCG strike team set up air-monitoring equipment south of the spill site; unnecessary personnel and equipment were removed from the area; and air boats spread hay along the primary spill boundary north of the leak to facilitate fire ignition. Air boats equipped with propane torches ignited the hay and condensate at approximately 3:00 P.M. Rockefeller Refuge personnel monitored the fire by aircraft (Figure 5), and at approximately 5:30 P.M. the in-situ burn had removed condensate from approximately 20 acres of spill-affected marsh (Fontenot, 1995).

Final cleanup and pipeline repair

Construction and environmental crews excavated the leak site and repaired the pipeline on March 19, 1995. Response personnel continued to skim and absorb small amounts of condensate from the immediate leak site. The site was deemed clean by the USCG on March 20, 1995.

Lessons learned

1. Refuge staff should have heeded the advice of Mobil personnel and considered in-situ burning as a viable spill response technique during the early assessment phase of the incident. Four days elapsed before the in-situ burn was applied to the spill-affected area.
2. Refuge and Mobil personnel were initially hesitant to enlist the help of additional government regulators. All RRTVI members should have been contacted at the beginning of the incident for advice and direction.

Figure 5. Aerial view of the in-situ burn at Rockefeller Refuge oil spill, Cameron Parish, Louisiana

3. Booms did not make a tight ground seal in dense marsh vegetation and allowed condensate migration toward environmentally sensitive wetland areas.
4. Vehicular traffic, human ingress, and mechanical cleanup techniques were causing more damage than the spill.

Benefits and recommendations

Knowledge gained from the Rockefeller Refuge in-situ burn enabled RRTVI to develop draft "Guidelines for Inshore/Nearshore In-situ Burn." These guidelines were recently used to expedite an in-situ burn at the Samedan Oil Corporation for the August 9, 1996, crude oil spill in Cameron Parish, Louisiana.

The LSU research initiative and monitoring study evaluating the effects of the in-situ burn on wetlands should continue until the spill-affected area is recovered, since most in-situ burn studies lack preburn reference data. This information will be valuable to industry, researchers, resource agencies, landowners, and land managers.

Summary

Approximately 40 barrels of condensate oil was released into the Price Lake Management Unit at Rockefeller Refuge, Cameron Parish, Louisiana. Conventional mechanical cleanup techniques proved ineffective in containing and removing condensate. Responders were concerned that vehicular traffic, human ingress, and mechanical cleanup procedures would cause more damage than the spill. In-situ burning was proposed as an alternative cleanup method. A tremendous effort of cooperation between industry, state, and federal agencies ensued to gain burn approval. The burn was applied to the spill-affected wetland 4 days after the pipeline leak was discovered. Monitoring will continue until the spill-affected area has recovered.

References

1. Fontenot, J. C., 1995. SOPCO gas pipeline leak, initial environmental site assessment. Soil and Crop Damage Appraisals, Lafayette, Louisiana, 52pp
2. Henry, C. B., 1996. Fate of spilled oil following application of in-situ burning as a spill mitigation technique at Louisiana's Rockefeller Refuge: Chemistry results from year one monitoring study. Technical Report Number IES/RCAT96-23. Institute for Environmental Studies, Louisiana State University, Baton Rouge, Louisiana, 48pp
3. Hoffpauer, C. M., 1967. Burning for coastal marsh management. *Proceedings of the Marsh and Estuary Management Symposium.* Louisiana State University, Baton Rouge, Louisiana, 250pp
4. Joanen, T., L. McNease, and H. Dupuie, 1969. Vegetation survey of Rockefeller Refuge impoundments. Annual Progress Report. Louisiana Wildlife and Fisheries Commission, New Orleans, 13pp (mimeo)
5. Lynch, J. J., 1941. The place of burning in management of the gulf coast wildlife refuges. *Journal of Wildlife Management* v5, n4, pp454–457
6. Wicker, K. M., D. Davis, and D. Roberts, 1983. Rockefeller State Wildlife Refuge and Game Preserve: Evaluation of wetland management techniques. Louisiana Department of Natural Resources, Coastal Management Section, 56 pp