

OIL SPILL SCIENCE *and* TECHNOLOGY



Edited by
Mervin Fingas



Oil Spill Science and Technology

Prevention, Response, and Cleanup

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Mervin Fingas



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Oil Spill Science and Technology

Preface

Oil spill studies continue to evolve. While there are few books on the topic, there are regular conferences and symposiums which provide updates. This is the first book on the topic of oil spills for some time. As such, this book focuses on providing material that is more practical and somewhat introductory. While every attempt was made to include the essential material, there may be some gaps. The importance of many sub-topics changes with time and current spill situations.

All material in this book, including introductions have been peer reviewed by at least two persons. The following peer reviewers are acknowledged (in alphabetical order): Carl Brown, Phil Campagna, Francois Charbonneau, Dagmar Schmidt Etkin, Ken Doe, Eric Gundlach, Kurt Hansen, Mike Kirby, Debra French McCay, Hugh Parker, Roger Percy, Karen Purnell, Doug Reimer, Gary Sergy, Debra Simecek-Beatty, Heidi Stout, Jordan Stout, Zhendi Wang, and Chun Yang. A special thanks goes out to the following reviewers who reviewed several papers (again in alphabetical order): Fred Beech, Leigh de Haven, Ben Fieldhouse, Anita George-Ares, Ron Goodman, Peter Lane, Robin Law, Bill Lehr, Jacqui Michel, and William Nichols.

A special thanks goes out to the authors, many of whom put in their own time to complete their chapters. Their names appear throughout the text. Following this forward, I have a brief biography of each of them.

I would also like to thank the many people who provided support and encouragement throughout this project, especially Meibing. I also thank Environment Canada and my former colleagues for their help and support. Environment Canada is acknowledged for permission to use materials and photos from my former employment.

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Greg Challenger Greg Challenger is a Principal Marine Scientist for Polaris Applied Sciences, Incorporated in Seattle, Washington, U.S.A. Mr. Challenger is a marine ecologist by training and is involved in scientific support for oil spill and ship grounding response, natural resource injury assessment and development of habitat restoration programs. He has been a lead investigator for nearly 50 large vessel groundings, oil spills, and wreck removal operations in the Western Atlantic, Caribbean Sea, and Indo-Pacific Oceans.

Dagmar Etkin Dagmar Schmidt Etkin has 35 years of experience in environmental analysis — 14 years investigating issues in population biology and ecological systems, and 21 years specializing in the analysis of oil spills. For the past 10 years, she has been president of Environmental Research Consulting (ERC), focusing on providing regulatory agencies and industry with sound scientific data and perspectives for responsible environmental decision-making. Dr. Etkin has a BA from University of Rochester, and M.A. and PhD from Harvard University. She is a member of the American Salvage

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Merv Fingas Merv Fingas is a scientist focussing on oil and chemical spills. He was a spill researcher in Environment Canada for over 30 years and is currently working privately in Western Canada. Mr. Fingas has a PhD in Environmental Physics from McGill University, three masters degrees; Chemistry, Business, and Mathematics, all from University of Ottawa. His specialities include: spill dynamics and behaviour, spill treating agent studies, remote sensing and detection, and in-situ burning. He has over 750 papers and publications in the field. Dr. Fingas has been editor of the Journal of Hazardous Materials for 6 years. He has served on two committees on the U.S. National Academy of Sciences on oil spills including the recent 'Oil in the Sea'. He is chairman of several ASTM and inter-governmental committees on spill matters.

Bruce Hollebone Bruce Hollebone is a chemist with 14 years experience in the field of chemical and oil spill research and development. He has a PhD in Chemistry from the University of British Columbia. His research interests include: the fate and behaviour of oil and petroleum products in the environment, including simulation of spill behaviours in the laboratory; the development of new methods for physical and chemical analyses relevant to spills studies; environmental forensics for oil spill suspect-source identification; and environmental emergencies response. He currently works at the Oil Research Laboratory of Environment Canada.

Mark Kirby Mark is an internationally recognised senior Ecotoxicologist with over 20 years experience working on studies pertaining to aquatic pollution. He has worked extensively on the toxicological impacts of oil and chemical spills and the assessment of appropriate methods of mitigation and has been involved in impact assessments in the UK from the *Sea Empress* to the *MSC Napoli*. He is a key advisor to the UK government and industry on the effects of oil and chemical spills in the marine environment and of any subsequent treatment actions (e.g. dispersants, sorbents etc.). Mark oversees the toxicological testing and approval of oil spill treatment products for use in UK waters and is the coordinator of a national initiative in the UK, PREMIAM (www.premiam.org), to implement improved post spill monitoring and impact assessment practices. He is first author of over 15 scientific papers and numerous reports in the field and continues to be actively involved in associated environmental research.

Alain Lamarche Mr Lamarche is a recognized expert in spill response management systems. He has been involved in the analysis and management of environmental data since 1979. Mr. Lamarche has been responsible for the development and implementation of many computerized environmental decision support systems databases. He is also the original designer of the ShoreClean® and ShoreAssess software, dedicated to the provision of Shoreline Cleanup Assessment Technique (SCAT) data management support, and

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Robin Law Robin Law is a chemist who joined Cefas (The UK Centre for Environment, Fisheries, and Aquaculture Science) in 1975. During the last 35 years he has been involved in the response and impact assessment activities following a number of major oil and chemical incidents, including the blow-out on the *Ekofisk Bravo* platform, and from the oil tankers *Amoco Cadiz*, *Eleni V*, and *Sea Empress*, and the chemical tankers *Ievoli Sun* and *Ece*. Most recently, he designed and operated an environmental monitoring programme targeting oil and chemicals following the grounding of the container ship *MSC Napoli* on the south coast of the UK in 2007. Currently, he leads an emergency response team that advises UK government following oil and chemical spills at sea.

Gary Mauseth Mr. Gary Mauseth has over 35 years of experience in the management and technical aspects of a wide variety of projects in the marine and freshwater environments. He has provided scientific support to vessel interests in over 90 spills, groundings, and natural resource damage assessment cases in the United States and its territories, as well as Canada, Mexico, the Caribbean and Mediterranean Seas, Micronesia, South America, and Europe. He has conducted research on the fate and effects of spilled oil, as well as the environmental effectiveness of response techniques, and has authored numerous publications and presentations on oil spill response, NRDA, and ecological restoration. Mr. Mauseth is a principal and President of Polaris Applied Sciences in Kirkland, Washington, USA. He has a Bachelor of Science in Biology from Whitman College in Walla Walla, Washington and a Master of Marine Biology from University of the Pacific, Pacific Marine Station, Dillon Beach, California.

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Debra Simecek-Beatty Debra Simecek-Beatty has been a physical scientist for the NOAA's Emergency Response Division for 25 years. She has a Masters degree in Marine Affairs from the University of Washington. During an emergency response, she is responsible for providing estimates of the movement and behavior of the spill. This includes collecting visual observations, remote sensing information, wind and current data, and computer modeling output to form an analysis. In addition, she is responsible for interfacing with local experts (i.e., meteorologist, academia, researchers) in formulating the trajectory analysis.

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