

CONTENTS

List of contributors xi

Use of acronyms xvii

Acknowledgments xviii

A bibliographic note xx

David K. Johnson and Laura R. Rustin

Prologue xxii

PART I INTRODUCTION AND BACKGROUND

1. Introduction and background 3
John A. Wiens
2. The phases of an oil spill and scientific studies of spill effects 37
Paul D. Boehm, Erich R. Gundlach, and David S. Page

PART II OIL IN THE ENVIRONMENT

3. Oil in the water column 57
Paul D. Boehm, Jerry M. Neff, and David S. Page
4. Surveying oil on the shoreline 78
Edward H. Owens and P. Douglas Reimer
5. Ancient sites and emergency response: cultural resource protection 98
Chris B. Wooley and James C. Haggarty
6. Fate of oil on shorelines 116
David S. Page, Paul D. Boehm, John S. Brown, Erich R. Gundlach, and Jerry M. Neff
7. Understanding subsurface contamination using conceptual and mathematical models 144
Gary A. Pope, Kimberly D. Gordon, and James R. Bragg
8. Removal of oil from shorelines: biodegradation and bioremediation 176
Ronald M. Atlas and James R. Bragg

PART III BIOLOGICAL EFFECTS

9. Cytochrome P450 1A (CYP1A) as a biomarker in oil spill assessments 201
James T. Oris and Aaron P. Roberts
10. Assessing effects and recovery from environmental accidents 220
Keith R. Parker, John A. Wiens, Robert H. Day, and Stephen M. Murphy
11. Shoreline biota 241
Erich R. Gundlach, David S. Page, Jerry M. Neff, and Paul D. Boehm
12. Oiling effects on pink salmon 263
Ernest L. Brannon, Matthew A. Cronin, Alan W. Maki, Larry L. Moulton, and Keith R. Parker
13. Pacific herring 292
Walter H. Pearson, Ralph A. Elston, Karen Humphrey, and Richard B. Deriso
14. Oil and marine birds in a variable environment 318
John A. Wiens, Robert H. Day, and Stephen M. Murphy
15. Sea otters: trying to see the forest for the trees since the *Exxon Valdez* 348
David L. Garshelis and Charles B. Johnson

Contents

PART IV ASSESSING OIL SPILL EFFECTS AND ECOLOGICAL RECOVERY

16. Characterizing ecological risks, significance, and recovery 383
Mark A. Harwell, John H. Gentile, and Keith R. Parker

PART V CONCLUSIONS

17. Science and oil spills: the broad picture 423
John A. Wiens

Index 446