

CONTENTS

Preface	ix
Acknowledgments	xv
1 A Generic Bioeconomic Model	1
1.1 What is Conservation?	1
1.2 What is a Model?	3
Exercises	4
1.3 A Dynamic Resource-Harvesting Model	4
Exercises	13
1.4 A Bioeconomic Model	14
Exercises	22
1.5 A Dynamic Optimization Model	23
Exercises	31
1.6 A Model of Individual Behavior	32
Exercises	39
1.7 Individual Vessel Quotas	40
Exercises	49
1.8 The Veil of Uncertainty	49

	Exercises	50
1.9	Other Resources	50
2	Dynamic Optimization	55
2.1	Constrained Optimization	55
	Exercises	61
2.2	Optimal Control Theory in One Dimension	62
	Exercises	75
2.3	Nonlinear Control Problems	76
	Exercises	82
2.4	Discrete-time Optimal Control	83
	Exercises	94
2.5	Appendix	95
	Exercises	98
3	Basic Economic Concepts	101
3.1	Interest and Discounting	101
	Exercises	106
3.2	Supply and Demand	106
	Exercises	116
3.3	Demand-limited Bionomic Equilibrium	116
	Exercises	125
3.4	Optimal Harvesting Strategies	125
3.5	External Costs	127
	Exercises	137
3.6	Competition, Cooperation, and the Theory of Games	137
	Exercises	142
3.7	The Economics of Uncertainty	142
	Exercises	150
4	Investing in Harvesting Capacity	153
4.1	Optimal Harvesting Capacity	154
	Exercises	162
4.2	Investment Decisions under Competition	163
	Exercises	167
4.3	Eliminating Excess Capacity	167
	Exercises	173
4.4	Appendix: Optimal Investment	174

5	Regulation of Renewable Resource Harvesting	179
5.1	The Consequences of Unregulated Resource Harvesting	179
	Exercises	185
5.2	Methods of Regulating Resource Harvesting	185
	Exercises	189
5.3	Shadow Prices, Taxes and Tradeable Quotas	189
	Exercises	211
5.4	Regulation without Taxes or Tradeable Quotas	212
	Exercises	221
6	Growth and Aging	223
6.1	Forestry Models	224
	Exercises	232
6.2	Fisheries: The Cohort Model	233
	Exercises	243
6.3	Multicohort Fisheries	244
	Exercises	250
7	Resource Management under Uncertainty	253
7.1	Process and Observational Uncertainty	255
	Exercises	260
7.2	Understanding Uncertainty	261
	Exercises	272
7.3	Process Uncertainty	273
	Exercises	276
	Exercises	279
7.4	An Introduction to Decision Analysis	279
	Exercises	283
7.5	Economic Uncertainties	284
	Exercises	287
7.6	Appendix: Bayesian Updating	287
	Exercises	300
8	Disaggregated Resource Models	303
8.1	Source-sink Models	304
	Exercises	304
	Exercises	309

- 8.2 Predator-prey Models
Exercises
- 8.3 Mixed-species Harvesting
Exercises

9 Synopsis

Problem Solutions

References

Index