

NATURAL RESOURCE CONSERVATION

Management for a Sustainable Future

Tenth Edition

DANIEL D. CHIRAS

Colorado College

JOHN P. REGANOLD

Washington State University

BRIEF CONTENTS

Preface						
Ackno	Acknowledgments					
Biogr	Biographies					
1	Natural Resource Conservation and Management: Past, Present, and Future	1				
2	Economics, Ethics, and Critical Thinking: Tools for Creating a Sustainable Future	25				
3	Lessons from Ecology	50				
4	The Human Population Challenge	86				
5	World Hunger: Solving the Problem Sustainably	105				
6	The Nature of Soils	123				
7	Soil Conservation and Sustainable Agriculture	141				
8	Integrated Pest Management	171				
9	Aquatic Environments	194				
10	Managing Water Resources Sustainably	226				
11	Water Pollution	257				
12	Fisheries Conservation	306				
13	Rangeland Management	347				
14	Forest Management	371				
15	Plant and Animal Extinction	406				
16	Wildlife Management	429				
17	Sustainable Waste Management	459				
18	Air Pollution	484				
19	Global Warming and Climate Change	513				
20	Acid Deposition and Stratospheric Ozone Depletion	531				
21	Minerals, Mining, and a Sustainable Society	549				
22	Nonrenewable Energy Resources: Issues and Options	563				
23	Creating a Sustainable System of Energy: Efficiency and Renewable Energy	597				
After	Afterword					
Gloss	Glossary					
Illustration Acknowledgments						
Index	Index					

CONTENTS

Preface			viii		Case Study 3.1 Life Returns to Mount		
cknowledgments			хi			St. Helens: A Dramatic Example	-
Biographies		xii		Registration	of Succession	75	
nogre	финоо		ΛII		3.5	The Biomes	76
4	Natu	ral Resource Conservation and			3.6	Ecology and Sustainability	81
1	Management: Past, Present, and Future		1	4	The Human Population Challenge		86
	1.1	A Crisis on Planet Earth?	1 -	- 4	4.1 Understanding Populations		
	1.2	Differing Viewpoints: Are We on a				and Population Growth	86
		Sustainable Course?	4		4.2	The Impact of Overpopulation	93
	1.3	A Brief History of the Resource Conservation, Environmental,			Ethi	cs in Resource Conservation 4.1	0.5
		and Sustainability Movements	6		4.2	Is Reproduction a Personal Right?	95
	Case	e Study 1.1 The Earth Summit			4.3	Population Growth in the More- Developed Nations: A Closer Look	96
		and Beyond	10		4.4	Population Growth in the Less-	90
	1.4	Classification of Natural Resources	12		4.4	Developed Nations: A Closer Look	97
	1.5	Approaches to Natural			4.5	Controlling the Growth of the World's	
		Resource Management	13			Population	97
	1.6	Changing Realities: Environmental			4.6	Human Population and the Earth's	
	1 7	Synergies	16			Carrying Capacity	100
	1.7	New Tools for Resource Management: Geographic Information Systems			Case	e Study 4.1 China: One of Family	
		and Remote Sensing	17			Planning's Success Stories?	101
	1.8	Risk and Risk Assessment	20		Mor	d Hunger: Solving the	
	1.9	The Environment and You:	20	5		lem Sustainably	105
		The Importance of Citizen Action	21		5.1	World Hunger: Dimensions	
					5.1	of the Problem	105
2		nomics, Ethics, and Critical Thinking:	219		5.2	Increasing Food Supplies Sustainably:	
	Tools for Creating a Sustainable Future		25		0.2	An Overview	108
	Ethi	cs in Resource Conservation 2.1			Ethi	cs in Resource Conservation 5.1 Feeding	
		Ethics Versus Economics?	26			People or Controlling Population	
	2.1	Understanding Economics	27			Growth?	109
	2.2	Creating a Sustainable Economy	32		5.3	Poverty, Conflict, and Free Trade	119
	2.3 Toward Sustainable Ethics		39		Tho	Nature of Soils	123
	Case Study 2.1 Geographic Information			6			
		Systems and Environmental Justice	42		6.1	Value of Soil	123
	1 000	none from Foology			6.2	Characteristics of Soil	123
3		sons from Ecology	50		6.3	Soil Formation	130
	3.1	Levels of Organization	50		6.4	The Soil Profile	133
	3.2	Scientific Principles			6.5	Soil Classification	134
	2.2	Relevant to Ecology	52	7	Soil	Conservation and Sustainable Agriculture	141
	3.3	The Flow of Energy Through	56	7		The Nature of Soil Erosion	
	3.1	Ecosystems Principles of Ecology	55 67		7.1 7.2	The Dust Bowl	141 143
	00	I THE DIES OF LEGIONY	07		1.4	THE DUST DOWL	14.7

V

	A Clo	oser Look 14.2 Genetic Engineering: The Key to Tomorrow's Superforests?	383		17.2	Managing Our Municipal Solid Wastes Sustainably	460
	14.5	Control of Forest Pests	384		Ethics	s in Resource Conservation 17.1 Do We	
		oser Look 14.3 Controlling Insect			Lines	Have an Obligation to Future Generations?	462
	116	Outbreaks with Heterotypes	387		17.2		468
		Fire Management	387			Waste Disposal: The Final Option	
	14.7	Meeting Future Timber Demands	200			Hazardous Wastes	470
	A CI.	Sustainably	390		Case	Study 17.1 The Chemical Time	171
	A CI	oser Look 14.4 Forest Conservation	202		4 63	Bomb at Love Canal	471
	110	by Efficient Utilization	392		A Clo	oser Look 17.1 Green Cleaning	177
		Preserving Wilderness	393		•	Products	477
	14.9	Protecting Natural Resources: National Parks	394		Case	Study 17.2 Exporting Toxic Troubles	479
	A Clo	oser Look 14.5 The Wilderness					
		Controversy	395	18	Air Po	llution	484
	14.10	Reversing Tropical Deforestation	399		18.1	Pollution of the Atmosphere	484
-					18.2	Major Atmospheric Pollutants	486
15	Plant	and Animal Extinction	406			7	
	15.1	Extinction: Eroding the Earth's				ser Look 18.1 The Clean Air Act	488
		Biological Diversity	407		18.3	Factors Affecting Air Pollution Concentrations	492
	A Clo	ser Look 15.1 Pesticide Drift and			18.4	Effects of Air Pollution on	
		the Worldwide Disappearance of	100		10	Local Climate	494
	17.0	Amphibians	408		18.5	Effects of Air Pollution on	
	15.2	Causes of Extinction	409			Human Health	494
	Case	Study 15.1 Dam Versus Darter: A Classic Confrontation	409		Case	Study 18.1 Asbestos: The Dangers	
	Case	Study 15.2 The Passenger Pigeon:	102			of a Useful Product	497
	Cusc	The Many Causes of Extinction	412		18.6	Air Pollution Abatement	
	GIS a	and Remote Sensing Mapping			Walt 2011 (1992)	and Control	499
	Noxious Weeds With GIS Ethics in Resource Conservation 15.1 Do		416		18.7	Indoor Air Pollution	505
					Case	Study 18.2 Tobacco Smoke:	
		Other Species Have a Right to Exist?	417			The Deadliest Air Pollutant	506
	15.3	Methods of Preventing Extinction	420				
	15.4	Endangered Species Act	423	19	Global	Warming and Climate Change	513
	1011	Endangered Species Fiet	723		19.1	Global Energy Balance and the	
16	Wildlif	e Management	429		1711	Greenhouse Effect	514
	16.1	Wildlife	429		19.2	Natural Factors That Influence	
	16.2	Types of Animal Movements	432			Global Temperature	514
	16.3	Mortality Factors	432		19.3	Anthropogenic Factors That Alter	
		oser Look 16.1 The Hunting	433			Global Temperature	516
	A CIC	Controversy	438		19.4	Are Global Warming and Global	
	16.4	Wildlife Management				Climate Change Occurring?	517
	16.5	Regulating Populations	440		19.5	Are Human Activities Causing	
			447			Global Warming?	520
		Study 16.1 The Everglades: Water Troubles in a Wildlife Paradise	449		19.6	Projected Impacts of Global Warming	521
	Ethics	in Resource Conservation 16.1 To Kill			19.7	Reducing or Eliminating Global	***
		or Not to Kill?	451		•	Warming	524
	16.6	Nongame Wildlife	455		Ethics	in Resource Conservation 19.1	
						Debate Over Global Warming: Do We	
17	Sustai	nable Waste Management	459			Have an Obligation to Other	
	17.1	Municipal Waste: Tapping a Wasted				Countries?	525
	one softettic	Resource	459		A Clo	ser Look 19.1 Going Green!	525

20	Acid Deple	Deposition and Stratospheric Ozone tion	531		22.4 Fusion Reactors22.5 America's Energ		591 592
	20.1 20.2	Acid Deposition Depletion of Stratospheric Ozone	531 541	23	Creating a Sustainable Efficiency and Renewal	-	597
21	Miner 21.1 21.2 21.3 21.4	Supply and Demand Can We Expand Our Mineral Supplies? Mineral Conservation Strategies Environmental Impacts of Mineral Production	549 549 553 555 557		 23.1 Energy Conservations Energy Efficience 23.2 Renewable-Energy A Closer Look 23.1 Sometimes Enters the Mains 23.3 Summary Afterword 	cy rgy Strategies olar Electricity	597 603 610 619
22	Nonrenewable Energy Resources: Issues and Options		563		Glossary Illustration Acknowledgments		625
	22.1	Global Energy Sources: An Overview	564				642
	22.2	A Closer Look at Nonrenewable Energy Resources	565		Index		644
	22.3	The Nuclear Energy Option: Is It Sustainable?	576				

vii

Contents