

---

# CONTENTS

INTRODUCTION 7

**PART 1: ECOLOGY AND THE WATERSHED CONCEPT 9**

**CHAPTER 1 WHAT IS A WATERSHED? 11**

- A Typical Watershed 12
- Magnification of Environmental Problems 14
- North American Bioregions and Their Watersheds 17
  - Eastern Deciduous and Mixed Forest Bioregion 18
  - Boreal Forest and Tundra Bioregion 19
  - Grassland Bioregion 20
  - West Coast Rainforest Bioregion 21
  - Desert Bioregion 22

**CHAPTER 2 HOW WATERSHEDS WORK: WATER AND NUTRIENT CYCLES 23**

- The Water Cycle 24
  - Aquifers and Groundwater 26
- The Carbon Cycle 28
- The Nitrogen Cycle 30
- The Sulfur Cycle 32
- The Phosphorus Cycle 33

**CHAPTER 3 FROM HEADWATERS TO OUTFLOWS: PARTS OF A WATERSHED 34**

- Wetlands 36
  - Marshes 37
  - Bogs 38
  - Fens 40
  - Swamps 42
- The Flowing Waters of Streams and Rivers 44
- The Still Waters of Ponds and Lakes 46
  - Lake Ecology 48
- Estuaries: Where Rivers Meet the Sea 50
  - Rocky Estuaries 52
  - Saltwater Marshes 53
  - Eel Grass Beds 53

**CHAPTER 4 NATURAL CHANGES WITHIN WATERSHEDS 54**

- Beaver Ponds and Meadows 55
- Natural Succession of Plant Communities 56
- Floods 58
- Eutrophication of Ponds and Small Lakes 60

**PART II: ENVIRONMENTAL ISSUES,  
IMPLICATIONS, AND SOLUTIONS 61**

**CHAPTER 5 AIR POLLUTION 62**

- Ozone 64
  - Good Ozone: The Ozone Layer 65
  - Bad Ozone: Problems at Ground Level 65
- The Greenhouse Effect 66
- Acid Rain 68
  - Acid Shock in Meltwater Pools 69
  - Dead Lakes 70
  - Forest Decline 70
  - Effects of Soils and Winds 71
- How Can I Help?: Air Pollution 72

**CHAPTER 6 WATER POLLUTION 74**

- Bioconcentration and the Effects of Contaminants 75
- Biomagnification 77
- Industrial Sources of Water Pollution 78
  - Oil Spillage 79
  - Industry 80
  - Thermal Pollution 81
  - Radioactive Wastes 81
- Urban Sources of Water Pollution 82
  - The Moral of Summer Thunderstorms 82
  - Sewage Treatment and Water Filtration 84
  - Alternative Sewage Treatment 86
- Nitrogen and Phosphorus Pollution: Too Much of a Good Thing? 88
- Agricultural and Rural Sources of Water Pollution 90
- How Can I Help?: Water Pollution 92
- How Can I Help?: Environmentally Friendly Cleaners 96

**CHAPTER 7 THE IMPACT OF EXOTIC SPECIES: HIDDEN INVADERS 98**

- Deceptive Beauty: Purple Loosestrife 100
- Sea Lampreys in the Great Lakes 101
- Norway Maples and the Native Forest 102
- How Can I Help?: Exotic Species 103

<b>CHAPTER 8 HABITAT LOSS AND DEGRADATION</b>	<b>104</b>
<b>Meddling With the Flow of Water: Dams and Other Intrusions</b>	<b>106</b>
Dams	108
Forestry Issues	111
Logging Practices	112
Additional Forestry Problems	114
Alternative Logging Practices	115
<b>How Can I Help?: Saving the Forests</b>	<b>115</b>
Agricultural and Rural Issues	116
Prairie Sloughs	119
Farming the Bottom Lands	120
<b>How Can I Help?: Habitat on the Working Farm</b>	<b>121</b>
Urban and Suburban Issues	122
Urban Rivers	124
<b>Problems with Fragmented Habitats: Landscape Ecology</b>	<b>126</b>
The Edge Effect	128
Wildlife Corridors	128
<b>CHAPTER 9 ECOLOGICAL RESTORATION: RIGHTING ENVIRONMENTAL WRONGS</b>	<b>130</b>
Restoring Habitats Close to Home	132
The Multiple Benefits of Native Plants	133
<b>How Can I Help?: Restoring Backyards</b>	<b>134</b>
<b>How Can I Help?: Stream and River Restoration</b>	<b>136</b>
Assessing Your Local Stream: How Clean is the Water?	138
Biological Indicators of Water Quality	138
Bioindicator Species for Fast-Flowing Streams	139
<b>CONCLUSION</b>	<b>140</b>
<b>APPENDICES</b>	<b>142</b>
I	The Five Kingdoms of Living Things 142
II	Food Chains, Food Webs, and Ecological Pyramids 143
III	Common Aquatic Invertebrates of Flowing and Still Waters 144
IV	Glossary 146
V	Selected Bibliography 148
<b>INDEX</b>	<b>149</b>