


# Audubon Perspectives



## REBIRTH OF NATURE

A COMPANION TO THE AUDUBON TELEVISION SPECIALS

**Roger L. DiSilvestro**

**Page Chichester**

PRINCIPAL PHOTOGRAPHER

**Christopher N. Palmer**

EXECUTIVE EDITOR



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**T**o those environmental activists—some of whom appear in these pages—working locally on the many critical issues that affect the quality of all our lives.

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National Audubon Society  
Membership Department  
950 Third Avenue  
New York, NY 10022

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# FOREWORD

**Peter A. A. Berle**

PRESIDENT, NATIONAL AUDUBON SOCIETY

The changes that human activities have brought to this planet have made habitat loss the number-one enemy of bird and wildlife survival. And, as Roger DiSilvestro so tellingly states here, if we continue to destroy the natural homes of wildlife, can we realistically believe that we will not, ultimately, destroy our own living place as well?

Protecting habitat, and with it biodiversity, is the most critical issue in environmental conservation today. It is what the National Audubon Society is all about. We began by establishing sanctuaries and hiring game wardens to protect birds and wildlife. We have developed in the past century, so that today we are an activist, chapter-based organization. We are able to act on the community level as well as in national and international arenas on issues of global environmental significance, for example, protecting ancient temperate forests, developing a national energy strategy based on conservation, fighting for wetlands protection, educating people about the impact of population growth on the environment, and protecting endangered species.

Yet sanctuaries, good science, public education, and member involvement at the community level remain the hallmark of Audubon's work.

Working together with dedication, we can win the environmental battles profiled in this book.

# PREFACE

**Christopher N. Palmer**

EXECUTIVE PRODUCER, AUDUBON TELEVISION SPECIALS

The mission of the National Audubon Society's television, books, software, and other mass-media projects is to enlarge and make more active and powerful the global constituency for a healthy and sustainable planet. After people have viewed our programs, we want them to feel inspired to take a more active role on environmental issues. Examples of such actions might include a renewed commitment to recycling, voting with an eye to environmental issues, writing to elected officials to urge them to stronger efforts on behalf of the environment, and joining Audubon or other environmental groups.

What drives this mission? As the twentieth century draws to a close, the human race finds that it has created environmental problems that threaten all life. More active involvement by people to protect the environment is crucial to human and wildlife survival. This involvement must come from a far larger constituency than "card-carrying" environmentalists.

The mission of the National Audubon Society is to protect the wildlife and wildlife habitat upon which our lives depend. Together with more than 600,000 members and an extensive chapter network in the United States and Latin America, our professional staff of scientists, lobbyists, lawyers, policy analysts, educators, and television producers are fighting to save threatened ecosystems and, thus, to restore the quality of life on the planet.

On important issues, from the protection of forests and wetlands to the battle against global warming, we work to influence key decision-makers at all levels of government, from local zoning boards to the United Nations. We manage and protect a nationwide system of wildlife sanctuaries and we promote citizen participation in a host of environmental projects, including community solid-waste management, acid rain monitoring, and local wetlands protection.

Undergirding all this work is our effort to reach out, through television, to the broader public. We produce four Audubon Television Specials a year. They are broadcast both on cable TBS SuperStation (thanks to Ted Turner) and on public television. This book, like its predecessor volume, *Audubon Perspectives: Fight for Survival*, is a companion to eight new Audubon Television Specials:

- "Danger at the Beach," produced by David Clark and hosted by Ted Danson, explores the threats to our coastlines.
- "Wildfire," produced by Tom Lucas and Larry Engel, and hosted by James Woods, investigates the positive side of natural fires.

- “Hope for the Tropics,” produced by Pam Hogan and hosted by Lauren Bacall, tells the stories of seven people who are really making a difference in saving the tropical forests of Costa Rica.
- “The New Range Wars,” produced by Roger Snodgrass and hosted by Peter Coyote, details the bitter conflict surrounding overgrazing in the West.
- “Great Lakes, Bitter Legacy,” produced by Tom Lucas and hosted by James Earl Jones, looks at the longer term impact of toxics in the Great Lakes area.
- “Mysterious Elephants of the Congo,” produced by Mark Shwartz and hosted by Jane Fonda, examines the plight of the African forest elephant.
- “Battle for the Great Plains,” produced by Judy Hallet and hosted by Jane Fonda, focuses on the Great Plains and asks what the rest of the world can learn from our experience there.
- “Ecotourism,” produced by Megan Epler-Wood and George Bell, and hosted by Sam Waterston, explores the role of tourism in saving (or destroying) our wild places.

With this companion book, our goal is to build on the excitement and concern generated by the Audubon Television Specials. This book enlarges on the information contained in the films and tells viewers what they can do to help solve some of our many vital environmental problems. We hope that this book will give readers and television viewers the knowledge and confidence that they need to take action on behalf of sound conservation.

This book was written by Roger DiSilvestro and most of the photos are by Page Chichester. If you enjoy this book, as I am sure you will, you may want to read another book on which they have recently collaborated, *The African Elephant, Twilight in Eden* (also published by John Wiley & Sons). Iain Douglas-Hamilton, the pioneer elephant researcher, described it as the “definitive elephant book—one of the very best.”

In getting these television programs and this book to a national audience, the team of people who accomplished this—Audubon, Turner Broadcasting, GE, WETA, PBS, and John Wiley & Sons—are lighting a candle. In 1780 in Hartford, Connecticut, an eclipse one day turned the sky from blue to gray, and the city had darkened over so densely that, in that religious age, people fell on their knees and begged a final blessing before the end came. The Connecticut House of Representatives was in session and many of the members clamored for adjournment. The Speaker of the House, Colonel Davenport, came to his feet and silenced the din with these words: “The day of judgment is either approaching or it is not. If it is not, there is no cause for adjournment; if it is, I choose to be found doing my duty. I move, therefore, that candles be brought to enlighten this hall of democracy.”

The television programs in this companion book, along with all the other programs and products that Audubon produces, will help to light a candle so our children can see their way better into the future.

# ACKNOWLEDGMENTS

As in the past, thanks must go first to Ted Turner, over whose cable television network (TBS SuperStation) the Audubon programs are aired in addition to their run as a summer series on public television stations nationwide. Turner has remained a staunch ally to Audubon television programming and to the environment, featuring our program on public-land grazing even though faced with organized opposition by well-financed grazing advocates, including serious boycott threats designed to block the broadcast of the program and stifle the free exchange of ideas upon which our society and our liberties are based.

Many of our colleagues at Audubon provided invaluable help in the production of this book, serving both as sources of information and as reviewers for the manuscript. They are Dede Armentrout, Jan Beyea, Dorie Bolze, David Cline, David Henderson, Maureen Hinkle, Ronald Klataske, David Miller, David Newhouse, Ed Pembleton, Carl Safina, Fran Spivy-Weber, and Tensie Whelan.

Two Audubon staff members, Delores Simmons and Ruth Thomas of the Television Department, helped with many of the details involved in travel for this book, making sure that reimbursement checks arrived in the right pockets. They also helped ensure that the many memos, manuscripts, and fax messages involved in producing this book went to and from the right people. Television Department intern Margaret Barker provided indispensable help with the research for the Great Plains chapter. Page Chichester, our principal photographer, also deserves special commendation for doing much of the research for the other chapters.

Any work of this sort involves the time, energy, and interest of many innocent people who fall victim to prolonged interviews, demanding manuscript reviews, long visits to their homes, late-night calls, and last-minute requests. For this and more we give a special thank you to Reynaldo Aguilar, a parataxonomist with INBio in San Jose, Costa Rica; Jim Barborak of the Caribbean Conservation Corporation; Mario Barrenechea, owner of Portico, a Costa Rican door company, and Rodolfo Peralta, a Portico forester; Dr. Pierre Béland and Robert Michaud of the St. Lawrence National Institute of Ecotoxicology in Rimouski, Quebec, Canada; Roger Berkowitz, president of Legal Seafoods, Boston; Manon Bombardier at the McDonald Raptor Center, McGill University, near Montreal, Quebec, Canada; Catherine Bourne, wildlife inspector with the U.S. Fish and Wildlife Service in Baltimore, Maryland; Randy Braun, environmental scientist with the Environmental Protection Agency in Edison, New Jersey; information officers James Caldwell, Ollie Van Crump, Diane Drobka, Wendell Peacock, and others who worked the 1990 fire at Yosemite National Park; Tanya D'Ambrosio, who, as an official of the Costa Rican Board of Tourism, made the author's travel in that nation a rare delight; Don Despain, research biologist at Yellowstone National Park; John Dinga and Mike Borek of Harbor Explorations at the University of Massachusetts at Boston; Steve Dobrott, wildlife biologist at Buenos Aires National Wildlife Refuge in Arizona; Richard Donovan, a World Wildlife Fund forestry consultant; Iain Douglas-Hamilton, an elephant researcher in Kenya; Jim Fish, a founder of the Public Lands Action Network in Albuquerque, New Mexico; Scott Franklin and Donald Pierpont, fire captains for the County of Los Angeles; Lynn Gooding, inspector, Washington State Department of Ecology in Olympia, Washington; Jerry Holechek, professor of range sciences at New Mexico State University, Las Cruces; Jerry Hoogerwerf, a pilot with Project Light Hawk, who provided a photographic flight over Rio Puerco, New Mexico; David Hull, water-resource specialist in Arcata, California; Steve Johnson, founder of Native Ecosystems, an environmental consulting service in Tucson, Arizona; Dianne Jurgen, a public

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Heartfelt thanks for their singular professional skills and profound patience with an often sagging deadline schedule go to David Sobel, the editor for John Wiley & Sons, and Marcia Samuels, the production whiz who navigated the photographs and manuscript through various critical production channels at Wiley. The very best in promotional support came from Wiley's Peter Clifton and Los Angeles public relations consultant Caroline O'Connell, both of whom have been invaluable to the success enjoyed by some of the author's previous books.

The narrators of the Audubon specials included in this book gave generously of their time from busy schedules and demanding professional lives. They are Lauren Bacall, Peter Coyote, Ted Danson, Jane Fonda (whom we thank twice, for hosting two programs), James Earl Jones, Sam Waterston, and James Woods.

No book could ever be completed without the diligent support of those on the home front. The support troops during the most strenuous battles of the book war were Jeanne Marquis, Ini Chichester, and Gail Shearer, the significant others of the author, photographer, and executive editor respectively.

And thanks to all our readers and viewers, without whose continued interest and support neither the television nor book projects would be possible.

CHRISTOPHER N. PALMER  
ROGER L. DiSILVESTRO  
PAGE CHICHESTER

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## REBIRTH OF NATURE

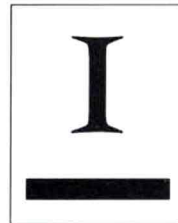
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# LOOK HOMEWARD, CONSERVA- TIONIST

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In this book we are going to talk a lot about habitat. At first blush that may seem a dull subject, the sort that puts college science students into deep and restful slumber. But the subject is far from dull. Indeed, it lies at the heart of today's most critical wildlife conservation issues.

Human activities threaten to destroy up to half the world's species within the next few decades, perhaps as many as 15 million different types of plants and animals. Most of these species are being wiped out not by overhunting or poaching but by loss of habitat. When habitat disappears, species disappear. This destructive loss of habitat is happening even though knowledge accumulated about the biological workings of the planet has shown clearly how intimately interrelated

are all species, how interdependent they are for survival—how interdependent *we* are for survival. But habitat destruction goes on apace, as if humankind were either compulsively suicidal or hopelessly reckless.

A *habitat*, in the very simplest of terms, is a place in which an organism lives. It provides the organism with all its biological needs. These needs vary from species to species, but usually include food, water, atmosphere, shelter, and enough space to allow the individual organism to take advantage of those essentials without competing too strenuously with other members of the same species.

The term *habitat* covers a gamut of living places. A forest is a habitat, home to a tremendous variety of creatures—trees, shrubs, grasses, fungi, bacteria, protozoa, lichens, birds, insects, mammals, reptiles, fish, amphibians—hundreds, indeed thousands, of species. A puddle of water is a habitat, home perhaps to insect larvae, tadpoles, microscopic plants and animals, a whole array of living things. The ocean is a habitat, the desert is a habitat, the human intestine is a habitat. Taken to its extreme, the term *habitat* almost seems to encompass everything you can lay your eyes on and many things you cannot.

It probably could go without saying that humans are as habitat dependent as any other living thing. We need food, water, shelter, and the rest as much as does any plant or nonhuman animal. Our specific biological needs make it impossible for us to live in regions deficient in one or more essential. Think of living in the heart of the Sahara or the Antarctic or cast adrift in the ocean. These places, without a lot of hardship and hard work, are not for us. We have been adapted through the long course of evolution to certain conditions of habitat. We know this implicitly. When we look at other planets, with scorching surfaces or atmospheres of methane gas, we know that we could not live there, nor could anything else on Earth. We say, "Life as we know it cannot exist there." Life as we know it can live only on Earth, because Earth, or some portion of it, is our habitat. The link between life and planet is, to all practical purposes, unbreakable. Nevertheless, we have done a poor job of protecting the habitats upon which we depend.



### ***The Mutuality Factor***

Species are linked not only to their habitats, but to one another. This happens on a large scale, as when a species such as the koala becomes adapted to eating only the leaves of the eucalyptus tree or the black-footed ferret to eating primarily one species of rodent, the prairie dog. But vital bonds between species also exist on a much more subtle level.

Some classic examples are found in the tropical rainforests. Because air movement in rainforests is limited, many tropical plant species depend upon animals for pollination and so have developed a number of mechanisms to enhance the process. One case is the durian, a tree that produces fruits sought by a wide variety of species, including tortoises, elephants, deer, rhinos, bears, and even tigers. About 45 percent of the durians that flower in Malaysia are pollinated by bats. Not surprisingly, the durians have become closely adapted to the bat's daily schedule: The durian's stamens are receptive to pollen only at about 8 P.M., when the bats are active. This relationship shows how the survival of various rainforest species are intimately linked. Without the bats about half the durian species would vanish, and the animals that feed on its fruit would lose an important food. This makes many animal species, as well as the durian, dependent on the bat. And since the bats feed on many other species when the durians are not flowering, the bat's survival depends on the survival of a large number of other plant species. Thus the durian's fate is irrevocably tied to that of

**M**ushrooms growing in a Caribbean island rainforest can be a habitat for uncounted insects and microorganisms. Rainforests cover only a small percentage of Earth's surface, yet host nearly half the world's species.

a myriad of other rainforest plants, as is the fate of several species of forest animals.

One of the most fascinating relationships between plant and animal concerns pollination in fig trees, which number some 450 species in Malaysia and Indonesia alone. Figs produce three types of flowers—male, female, and gall flowers. The gall flowers are shaped like flasks and bloom inside a larger flask-shaped organ, called a pseudo-fruit because it resembles the fig's seed-bearing fruits. Tiny wasps live inside the gall flowers, where they were deposited as eggs. When the wasps emerge, the wingless males mate with the females and then die. The females then leave the pseudo-fruit, coming into contact with pollen-producing male flowers as they go. The production of the pollen coincides with the emergence of the wasps, which exit the pseudo-fruit covered with pollen. The pollen-laden females fly to other fig trees and, preparing to lay eggs, enter the flower-bearing pseudo-fruits, where their contact with female flowers results in cross-pollination.

Another classic case of intimacy between insect and pollinating plant is that of the bee and the orchid. The elaborate flowers produced by orchids are mechanisms for attracting insects and for covering them with pollen.

A prime example begins with the courtship ritual of Central American euglossine bees. Male euglossines attract females by performing a courtship flight in shafts of sunlight. But it is not the bees' dazzling color alone that attracts the females. The males also wear a fragrant, oily perfume obtained from an orchid that produces it to attract the male bees. The bees land on the flower to collect the oil and, at the

Coastal development near Atlantic City, New Jersey, spells doom and destruction for wetlands and wildlife. Such shortsighted activity often is a self-defeating proposal as well, since many houses are built on eroding sands.





same time, receive a load of pollen. As they fly from flower to flower in search of oil, they spread the pollen about.

What happens in the flower as the bee tries to collect the oil can be quite complicated. Good examples occur among the 20 or so species of Central American bucket orchids. A male euglossine bee that lands on the edge of the orchid's bucket-shaped flower finds it cannot get a firm foothold on the waxy surface. The bee slides into the bucket, which is filled with a fluid that drips into it every day at dawn from a gland located on the bucket rim. The bee struggles to get out but finds only one avenue of escape, a little step that allows it to crawl out of the fluid. The step leads into a tunnel, which leads to the outside. Willy-nilly, the bee scuttles down the tunnel. As it emerges from the tunnel into sunlight, another organ snaps down on it, locking it in place. At this moment, a packet of pollen is glued to its back. When the bee is finally released, the pollen stays in place until the bee enters another flower of the same orchid species. It then goes through the same process, but this time, as it moves down the escape tunnel, a hook in the roof snatches away the pollen and the flower is fertilized. As for the bee, it receives another pollen packet upon exiting.

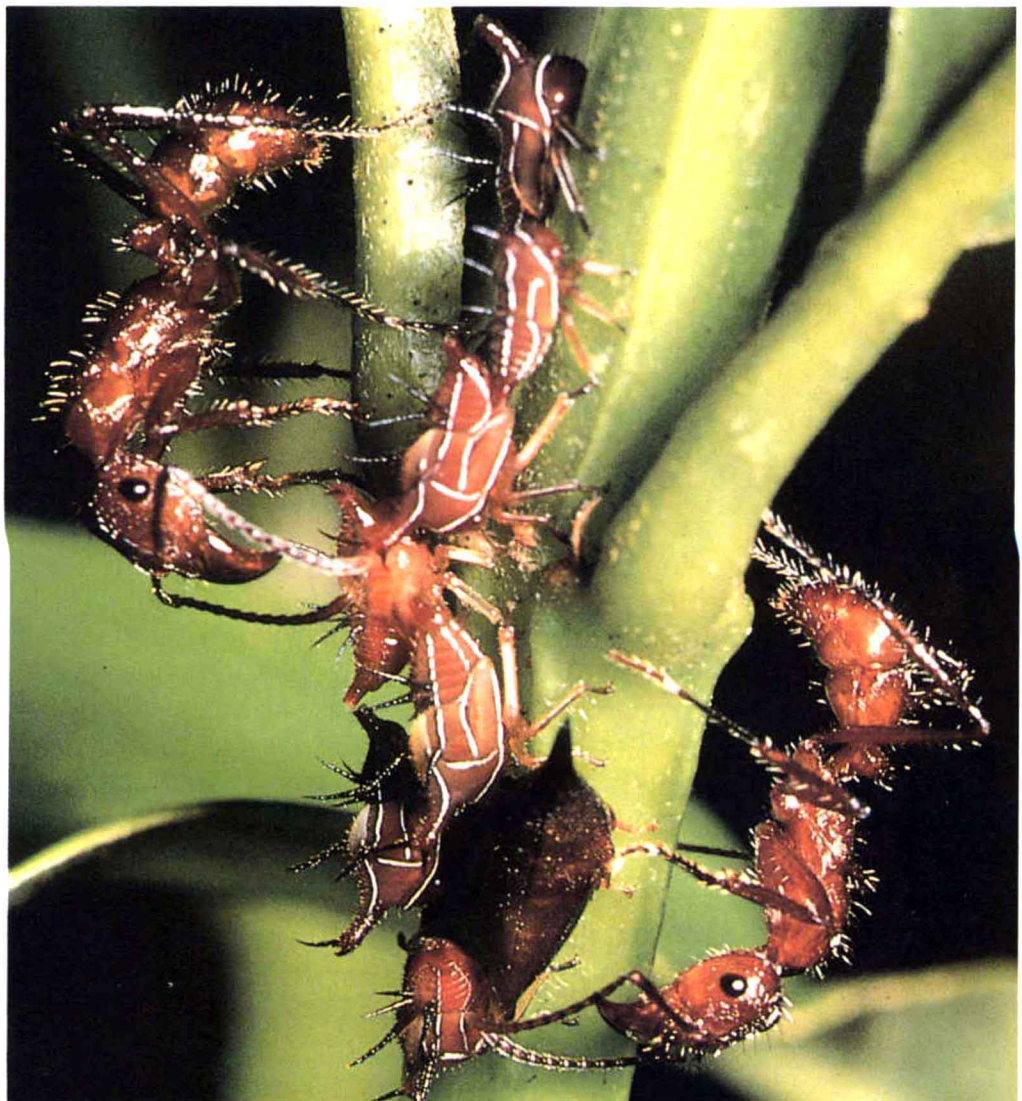
In many such cases, orchids and bees have co-evolved so that the bee has certain anatomical features that adapt it to pollinating only one or a few orchid species, and the orchids have adapted so that they can be pollinated by only one or a few bee species. This selectivity, and the elaborate mechanisms that some orchids use to apply pollen to bees, help ensure that each orchid flower receives pollen only from others of its own species. This prevents infertile crossbreeds. It also indicates that there is tremendous evolutionary pressure for individuals of widely scattered species to evolve means by which to find one another.

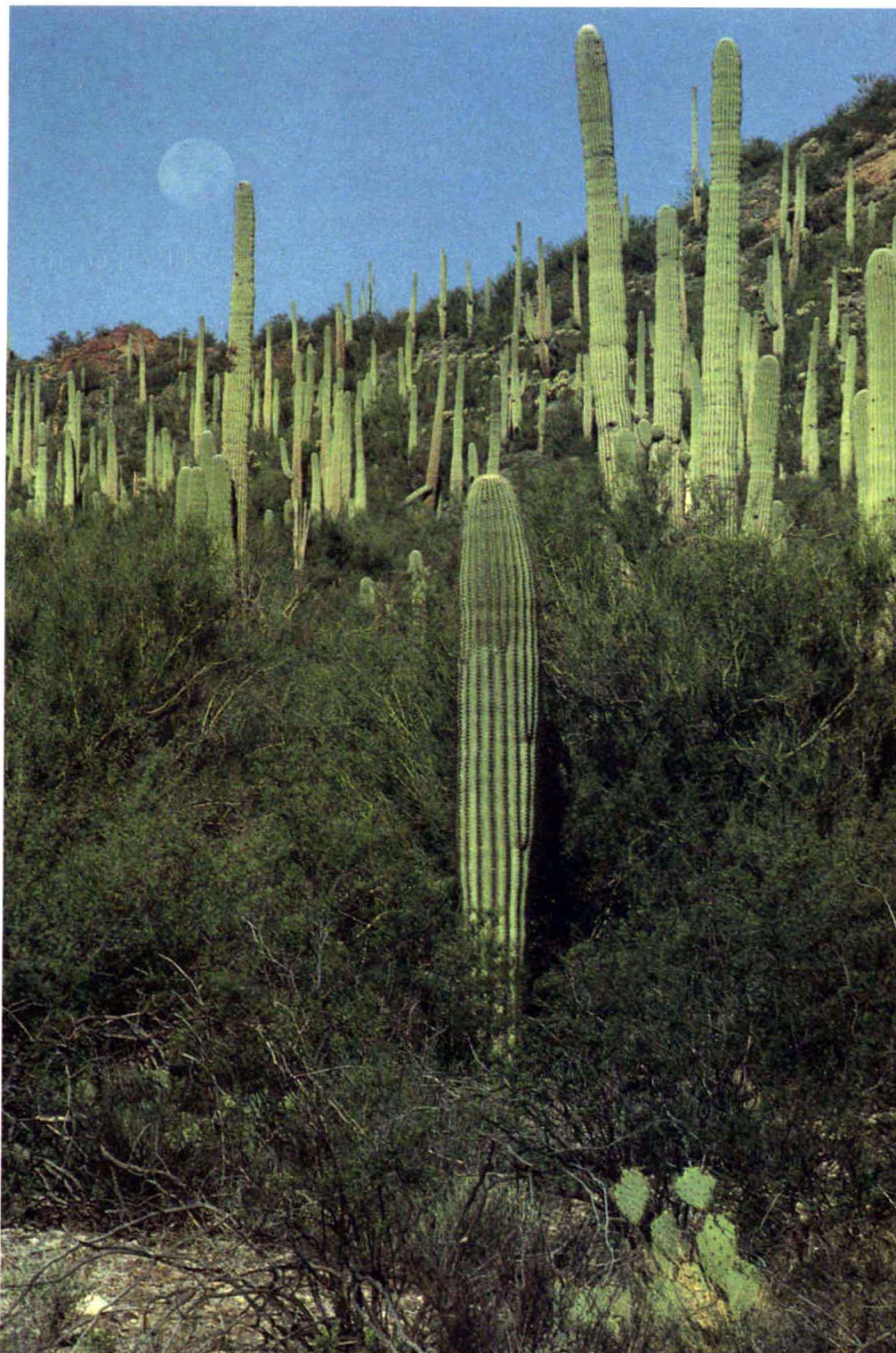
**E**ggs cover a horseshoe crab at Reeds Beach, on New Jersey's Delaware Bay shore. The crabs emerge from the sea en masse in mid-May to lay their eggs, which provide migrating shorebirds with a crucial supply of protein.

Bees are also crucial to the prosperity of the Brazil nut tree. In this case, the bees are allied with agoutis, a type of large rodent, and with an important commercial industry: About \$20 million worth of the nuts are exported to the United States alone each year. The nuts are harvested from wild trees because attempts to create Brazil-nut plantations have failed. Apparently the trees can grow only in mixed forests that contain a wide array of species. Among these species are euglossine bees, the same ones that pollinate orchids. How Brazil-nut trees are pollinated is still a mystery, but the bees may play a role in successful Brazil-nut reproduction, since it is well known that the trees will not reproduce in areas that lack euglossine bees. This also means that the trees will not grow in areas that lack the other plants, such as orchids, upon which the bees feed. Moreover, Brazil nuts cannot germinate without the help of the agoutis, the only animals known to crack open the hard-shelled pods that contain the Brazil nuts. Reproduction of Brazil-nut trees therefore also depends on the presence of all the plants and animals that the agouti needs to survive. The rainforest is much like a house of cards. The whole may begin to collapse if a single critical part is removed.

Virtually every habitat type has examples of crucial bonds between species. In the deserts of the U.S. Southwest, the decline of the Mexican free-tailed bat, caused by human disturbance of bat caves, may be jeopardizing survival of the giant saguaro cactus, which depends upon

**A**nts tending  
planthoppers in  
Chilamante, Costa Rica,  
provide an illustration of  
co-evolution. Species that  
share a habitat develop  
adaptations to one another,  
increasing their chances for  
survival.





**T**he moon races ahead of dusk at Saguaro National Monument near Tucson, Arizona. Disappearance of the Mexican free-tailed bat, which pollinates the tall cacti, could mean the end of the saguaro.

the bat for pollination. Loss of the cactus could in turn jeopardize bird species that nest within it. As human inroads drive species to extinction, habitats and species complexes are undermined. The undermining of habitats in turn causes the loss of more species, which further undermines habitat, and so on. Even a cursory look at the world's grasslands, forests, wetlands, and seas shows that humanity, in its sweep across the planet, is ruining vast natural systems.

Less apparent, however, is humanity's dependence on the natural environment. As we literally cut the ground out from under millions of species, we are eroding our own turf, too. This may not seem ap-