

WAR AND TROPICAL FORESTS

CONSERVATION IN AREAS
OF ARMED CONFLICT



STEVEN V. PRICE
EDITOR

War and Tropical Forests: Conservation in Areas of Armed Conflict

Steven V. Price
Editor

War and Tropical Forests: Conservation in Areas of Armed Conflict
has been co-published simultaneously as *Journal of Sustainable
Forestry*, Volume 16, Numbers 3/4 2003.



CRC Press

Taylor & Francis Group

Boca Raton London New York

CRC Press is an imprint of the
Taylor & Francis Group, an informa business

CRC Press
6000 Broken Sound Parkway, NW
Suite 300, Boca Raton, FL 33487
270 Madison Avenue
New York, NY 10016
2 Park Square, Milton Park
Abingdon, Oxon OX14 4RN, UK

Published by

Food Products Press®, 10 Alice Street, Binghamton, NY 13904-1580 USA

Food Products Press® is an imprint of The Haworth Press, Inc., 10 Alice Street, Binghamton, NY 13904-1580 .

War and Tropical Forests: Conservation in Areas of Armed Conflict
has been co-published simultaneously as *Journal of Sustainable Forestry*, Volume 16, Numbers 3/4 2003.

© 2003 by Taylor & Francis Group, LLC
CRC Press is an imprint of Taylor & Francis Group, an Informa business

All rights reserved. No part of this work may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, microfilm and recording, or by any information storage and retrieval system, without permission in writing from the publisher.

The development, preparation, and publication of this work has been undertaken with great care. However, the publisher, employees, editors, and agents of The Haworth Press and all imprints of The Haworth Press, Inc., including The Haworth Medical Press® and Pharmaceutical Products Press®, are not responsible for any errors contained herein or for consequences that may ensue from use of materials or information contained in this work. Opinions expressed by the author(s) are not necessarily those of The Haworth Press, Inc. With regard to case studies, identities and circumstances of individuals discussed herein have been changed to protect confidentiality. Any resemblance to actual persons, living or dead, is entirely coincidental.

Cover design by Jennifer M. Gaska

Cover photo by Steven V. Price. Munchique National Natural Park, Colombia, 1995. Sign reads, "danger mined zone."

Library of Congress Cataloging-in-Publication Data

War and tropical forests : conservation in areas of armed conflict / Steven V. Price, editor.
p. cm.

"Co-published simultaneously as *Journal of Sustainable Forestry*, Volume 16, Numbers 3/4 2003."

Includes bibliographical references (p.).

ISBN 1-56022-098-8 (hard : alk. paper)—ISBN 1-56022-099-6 (pbk : alk. paper)

I. Forest conservation—Tropics. 2. Forests and forestry—Tropics. 3. War—Environmental aspects—Tropics. I. Price, Steven V. II. *Journal of Sustainable Forestry*.

SD414.T76 W27 2002

333.75'16'0913—dc21

2002152072

War and Tropical Forests: Conservation in Areas of Armed Conflict

CONTENTS

Preface <i>Steven V. Price</i>	xiii
Acknowledgements	xix
Biodiversity, War, and Tropical Forests <i>Jeffrey A. McNeely</i>	1
Contras and Comandantes: Armed Movements and Forest Conservation in Nicaragua's Bosawas Biosphere Reserve <i>David Kaimowitz</i> <i>Angelica Fauné</i>	21
Forests in the Time of Violence: Conservation Implications of the Colombian War <i>María D. Álvarez</i>	49
Lessons Learned from On-the-Ground Conservation in Rwanda and the Democratic Republic of the Congo <i>Andrew J. Plumptre</i>	71
Building Partnerships in the Face of Political and Armed Crisis <i>Annette Lanjouw</i>	93
Bushmeat Poaching and the Conservation Crisis in Kahuzi-Biega National Park, Democratic Republic of the Congo <i>Juichi Yamagiwa</i>	115
The Chainsaw and the Gun: The Role of the Military in Deforesting Indonesia <i>Charles Victor Barber</i> <i>Kirk Talbott</i>	137

Legal Mechanisms for Addressing Wartime Damage to Tropical Forests <i>Jay E. Austin</i> <i>Carl E. Bruch</i>	167
List of Acronyms	201
Appendix	205
Index	207

ABOUT THE EDITOR

Steven V. Price, MF, MA, is a forestry consultant. He was the principal organizer of the “War and Tropical Forests: New Perspectives on Conservation in Areas of Armed Conflict” conference held in 2000 at the Yale School of Forestry and Environmental Studies. Mr. Price holds master’s degrees in forestry and international relations and was a Fulbright fellow in Colombia during 1994-1995.



Taylor & Francis

Taylor & Francis Group

<http://taylorandfrancis.com>

Preface

From the lowland rainforests of the Colombian Amazon to the rugged habitat of Rwanda's mountain gorillas, wars are having severe impacts on tropical forests and the communities that they sustain. Armed conflicts, and the political, economic, and humanitarian crises they provoke, often lead to unsustainable exploitation of tropical forest resources and widespread habitat destruction. Political violence has also tragically claimed the lives of many conservationists and protected area staff in Africa, Asia, and Latin America. The reemergence of civil, ethnic, and international wars and the persistence of their impacts have caused many conservationists to reassess their efforts and adapt their strategies to a new set of responsibilities and urgent challenges. These challenges include preparing conservation programs and local communities for crises; maintaining conservation capacity during periods of conflict; addressing the underlying political and economic factors that fuel war; and developing the potential of conservation to help reduce the frequency, duration, and impact of violent conflicts.

The international conference *War and Tropical Forests: New Perspectives on Conservation in Areas of Armed Conflict* assembled a diverse group of researchers, conservation practitioners, and policy makers to explore these issues and draw greater attention to the conflicts currently affecting tropical forests. The eight chapters contained in this volume emerged from their papers and presentations. Their publication follows that of other recent works addressing the role of conservation in areas of armed conflicts or the conservation implications of war (see, Westing 1993; International Union for Conservation of Nature [IUCN] 1997, 1998; Naughton-Treves 1999; Austin and Bruch 2000; Blom et al. 2000; Peluso and Watts 2001; Shambaugh, Ogelthorpe, and Ham

[Haworth co-indexing entry note]: "Preface." Price, Steven V. Co-published simultaneously in *Journal of Sustainable Forestry* (Food Product Press, an imprint of The Haworth Press, Inc.) Vol. 16, No. 3/4, 2003, pp. xvii-xxii; and: *War and Tropical Forests: Conservation in Areas of Armed Conflict* (ed: Steven V. Price) Food Products Press, an imprint of The Haworth Press, Inc., 2003, pp. xiii-xviii. Single or multiple copies of this article are available for a fee from The Haworth Document Delivery Service [1-800-HAWORTH, 9:00 a.m. - 5:00 p.m. (EST), E-mail address: getinfo@haworthpressinc.com].

2001). However, considering the proliferation of armed conflict in tropical forests areas, the amount of scholarly attention given to the relationship between war and tropical forest conservation seems disproportionately small.

War has been a widespread and persistent phenomenon in the recent history of the tropics. Armed conflict develops under a broad range of social, political, economic, and environmental conditions and its implications for forest use and management are not consistent or predictable between regions or conflicts. This volume, therefore, does not present a single view of the impact that wars have on forest conservation, nor does it reach a consensus about the role that forest resources play in the outbreak or course of armed conflict. Nonetheless, the authors collectively highlight the potential for armed conflict and military power to affect the future of tropical forests. They also draw our attention to a range of critical issues that have not customarily fallen in the purview of conservationists: the trade of small arms; the role of militaries and armed groups in the inequitable control and illicit use of forest resources; the environmental impact of refugees and internally displaced populations; and the growing social and environmental costs of international efforts to eradicate drug crops from tropical landscapes.

The response of conservationists to these diverse challenges increasingly involves collaboration with international aid organizations, governmental agencies, advocacy groups, and even militaries. This collection of essays should therefore prove useful to conservation practitioners and policy makers as well as individuals and organizations concerned with human rights, conflict resolution, rural development, international law, and foreign relations. The following paragraphs describe some of the main themes and conclusions that emerge from this volume.

The impacts of armed conflict on forest resources and conservation capacity are diverse and overwhelmingly negative—The diverse biophysical impacts of war include habitat degradation, loss of wildlife and biodiversity, increased levels of pollution, and adverse changes to human and ecosystem health. In many ways, war and insecurity can also profoundly affect the capacity of local communities, protected area agencies, and non-governmental organizations to carry out conservation activities. While the consequences of armed conflict for tropical biodiversity have been largely negative, it is important to note that in some cases hostilities have positively affected biodiversity protection and other conservation objectives. The dynamic and unpredictable nature of change during armed conflict makes it vital for conservationists to keep abreast of events and monitor the development of threats, im-

pacts, *and* opportunities. Over the long-term, greater knowledge of the social, political, economic, and ecological dimensions of armed conflict will permit the development of more effective field strategies, policy prescriptions, and legal responses.

Conservation interests working in politically volatile regions must prepare for conflict and its aftermath—If conservation programs are to succeed—or even survive—in areas of conflict, they must be able to adapt and cope as political regimes fall, economies crumble, populations swell or shrink, and their logistical and financial support is suspended. By preparing for armed conflict and complex emergencies, conservation programs, local communities, and their partners can better cope with crises and avoid unnecessary environmental degradation. Over the past decade, the experiences of conservation organizations and protected area authorities—particularly in Africa—have yielded important lessons for improving the security and resilience of the conservation personnel and programs. These findings emphasize the critical importance of programmatic flexibility, contingency planning, political neutrality, training for junior-level staff, and collaboration with a broad range of stakeholders.

Threats to natural resource conservation can be severe during the post-conflict period—There are no simple conclusions about the relationship between war and tropical forests. However, a new maxim for conservation seems to be coined in the following pages by Jeffrey McNeely when he observes that, “while war is bad for biodiversity, peace can even be worse.” In the wake of war, the regulatory authority, norms, and customs that usually govern access to and use of natural resources may be left weakened or suspended. Armed groups often take advantage of “peacetime” by facilitating illegal extractive enterprises or by directly engaging in the outright plunder of valuable natural resources. Refugees, internally displaced people, and local communities may be left more dependent on the local resource base—including protected areas and forest reserves—for food and basic supplies. If conservation programs can maintain some presence or logistical capacity during periods of armed conflict, essential conservation activities can be more promptly restarted in the crucial post-conflict period.

Local communities can play a decisive role in conservation during armed conflict—The survival or demise of forests during wartime may depend on how the needs of desperate local populations are met. One major challenge is to help local communities cope with crisis without increasing threats to the local resource base and the long-term sustainability of their livelihood strategies. This may be particularly difficult

where crisis conditions aggravate existing conflicts between local interests and protected area authorities. Locally held grievances may predispose individuals to participate in unsustainable activities like wildlife poaching or logging, thus magnifying the destructive impact of war. Civil strife therefore provides another powerful argument for community-based efforts that emphasize the local benefits of conservation, strengthen community institutions, and help protect the property and customary-use rights of local people and forest-dwellers. In his contribution to this volume, David Kaimowitz observes that, “where people are willing to die to gain access to valuable natural resources, protected areas have little chance of surviving unless local groups have a strong stake in their success.”

International market forces and far-reaching economic agendas often fuel armed conflict—The links that exist between armed conflict, forest resource exploitation, and powerful international market forces suggest that natural resource abundance—rather than scarcity—often fuels or perpetuates conflict. In some of the most grievous and long-lasting armed conflicts, the activities of armies, militias, and warlords are financed by the international trade of forest resources. For example, the war in the Democratic Republic of the Congo has become mainly a struggle for control over access, exploitation, and trade of the country’s vast natural resources. With increasing globalization of trade and greater international consumption of tropical forest resources, the influence of market forces on armed conflict and forest resource exploitation may only grow.

Corruption and dysfunctional governance can exacerbate conflict and its environmental impact—In many countries, corrupt government agencies and military institutions facilitate the over-exploitation of natural resources, protect illicit trade networks, and reinforce inequitable patterns of resource control and use. Dysfunctional systems of governance and a lack of secure property rights are characteristic of many remote forest regions affected by armed conflict. These problems can be addressed at many different scales and in partnership with a variety of organizations and agencies that advocate human rights, arms control, certification regimes, sustainable development, and good governance.

Effective conservation in areas of armed conflict requires greater levels of collaboration in research, policy-making, and field programs—Some of the practical lessons detailed in this volume were borne of tragedies and failures in the field during wartime. Improvements to the safety, efficacy, and endurance of conservation programs can be made at a lower cost if international agencies, government ministries, relief

organizations, and conservation groups share their expertise, better coordinate their agendas, and more efficiently integrate their programmatic capacities. The complexity of the challenges described in this volume also requires more resourceful and creative combinations of disciplinary approaches. The task of revealing the interrelationships between processes such as deforestation, frontier colonization, internal displacement, political violence, and international trade is daunting. Some conflicts, like Colombia's chronic and extremely complex "violence syndrome"—described in this volume by María D. Álvarez—defy most traditional explanatory frameworks. The contributors to this volume accordingly draw upon and combine historical, geographic, ecological, legal, economic, and political analyses.

The following chapters are bound together by the conviction that conservation is not a "luxury" to be pursued only in areas unaffected by war. The conflicts affecting the mega-diversity forests of countries like Colombia, Indonesia, and the Democratic Republic of the Congo present conservationists with some formidable strategic, logistical, and conceptual challenges. Such conservation crises draw our attention to the destructive impacts of violent conflict, but they also reveal the great potential for forest conservation to contribute to the survival of local communities, the prevention of conflict, and the restoration of habitats, landscapes, and economies. The grave threats associated with armed conflict warrant greater efforts to develop these promising roles for conservation. In some cases, this implies a broader conservation agenda, new responsibilities, and some unorthodox partnerships. While innovations are needed to meet these emerging challenges, the contributors to this volume remind us that the traditional principles of good conservation—including adaptive management, equitable access and control of natural resources, and international cooperation—remain essential to the future of tropical forests, in times of war and peace.

Steven V. Price

REFERENCES

- Austin, J. and C. Bruch (eds.). 2000. *The Environmental Consequences of War—Legal, Economic, and Scientific Perspectives*. Cambridge University Press, Cambridge.
- Blom, E., W. Bergmans, I. Dankelman, P. Verweij, M. Voeten, P. Wit. (eds.). 2000. *Nature in War, Biodiversity Conservation During Conflicts*. Mededelingen No. 37. Netherlands Commission for International Nature Protection, Amsterdam.

- IUCN (International Union for Conservation of Nature–The World Conservation Union) (ed.). 1997. *Parks for Peace Conference Proceedings*. IUCN, Gland, Switzerland.
- IUCN. 1998. *International Symposium on Parks for Peace, Stelvio National Park, Bormio, Italy, 17-21, May 1998. Conference Proceedings*. IUCN, Gland.
- Naughton-Treves, L. (ed.). 1999. *Fighting in the Forest, Biodiversity Conservation Amidst Violent Conflict*. CDF Discussion Paper. Conservation and Development Forum, Gainesville.
- Peluso, N.L. and M. Watts (eds.). 2001. *Violent Environments*. Cornell University Press, Ithaca.
- Shambaugh, J., J. Ogelthorpe, and R. Ham (with contributions from Sylvia Tognetti). 2001. *The Trampled Grass: Mitigating the impacts of armed conflict on the environment*. Biodiversity Support Program, Washington, D.C.
- Westing, A.H. (ed.) 1993. *Transfrontier Reserves for Peace and Nature: A Contribution to Human Security*. United Nations Environmental Programme (UNEP), Nairobi.

Acknowledgements

This volume had its genesis in the international conference *War and Tropical Forests: New Perspectives on Conservation in Areas of Armed Conflict*. Organized by graduate students working under the auspices of the Yale Student Chapter of the International Society of Tropical Foresters (Yale ISTF), the conference was held at the Yale School of Forestry and Environmental Studies on March 31 and April 1, 2000. The essays in this volume were originally presented in some form at that meeting. Over the past year, the authors have updated their material, and in some cases, they have thoroughly rewritten their essays. Their participation in the conference and their contributions to this volume are deeply appreciated. A debt of gratitude is also due to the large group of expert reviewers who provided detailed and invaluable comments on earlier drafts of this volume. Three papers presented at the conference are not included here, but I wish to thank Patrick Alley of Global Witness, Jamison Suter of Fauna and Flora International, and independent author and journalist Bill Weinberg for their invaluable contributions to the conference.¹

Special thanks are owed to the series editor of the *Journal of Sustainable Forestry*, Professor Graeme P. Berlyn, for proposing this publication and for providing continuous logistical support. His assistant, Uromi Goodale, also helped facilitate the preparation of this publication. From the inception of the conference, Professor Mark Ashton provided invaluable guidance as Yale ISTF's stalwart faculty advisor and director of Yale's Tropical Resource Institute. It is also important to acknowledge Jay Austin and Carl Bruch at Environmental Law Institute, Thomas Dillon at World Wide Fund for Nature (WWF), and Jefferson Hall at Wildlife Conservation Society (WCS) for providing many invaluable ideas and contacts that helped shape the conference and therefore, this volume. Professor David Watts at the Anthropology Department of Yale University generously provided expert guidance on the editing of sections related to gorilla conservation. He and fellow professors Arun Agrawal, Enrique Mayer, James Scott, Daniela Spenser, and Eric Worby served as moderators during the conference and greatly enhanced the

panel discussions. A special note of appreciation is also due to Arthur W. Galston, Eaton Professor Emeritus of Molecular, Cellular, and Development Biology at Yale University, who provided inspirational closing remarks to the conference. Philip R. S. Johnson also provided suggestions that helped improve the preface to this volume.

The conference and this publication would not have been possible without the financial support provided by many programs and offices at Yale University. Thanks are therefore due to: Dr. Jim Bryan and the Tropical Resource Institute; Dean Gus Speth of the Yale School of Forestry and Environmental Studies; the Graduate School of Arts and Sciences symposium fund; Professor Donald Green and the Institution for Social and Policy Studies; the Yale Council on Latin American Studies; and the Class of 1980 Fund of the Yale School of Forestry and Environmental Studies.

NOTE

1. Bill Weinberg's conference paper was drawn from his comprehensive and uncompromising book *Homage to Chiapas, The New Indigenous Struggles in Mexico* (2000, Verso: New York). Patrick Alley's paper examined war, corruption, and forest policy in Cambodia, and drew upon Global Witness' authoritative reports on Cambodia. Global Witness' reports on war-related environmental issues in Asia and Africa are available at: <http://www.globalwitness.org>

Biodiversity, War, and Tropical Forests

Jeffrey A. McNeely

SUMMARY. Tropical forests are one of the world's last remaining frontiers. Like all frontiers, they are sites of dynamic social, ecological, political, and economic changes. Such dynamism involves constantly changing advantages and disadvantages to different groups of people, which not surprisingly leads to armed conflict, and all too frequently to war. Many governments have contributed to conflict by nationalizing their forests, so that traditional forest inhabitants have been disenfranchised while national governments sell trees to concessionaires to earn foreign exchange. Biodiversity-rich tropical forests in Papua New Guinea, Indonesia, Indochina, Myanmar, Sri Lanka, Central Africa, the Amazon, Colombia, Central America, and New Caledonia have all been the sites of armed conflict, sometimes involving international forces. While these conflicts have frequently, even invariably, caused negative impacts on biodiversity, peace is often even worse, as it enables forest exploitation to operate with impunity. Because many of the remaining tropical forests are along international borders, international cooperation is required for their conservation; as a response, the concept of international "peace parks" is being promoted in many parts of the world as a way of linking biodiversity conservation with national security. The Convention on Biological Diversity, which entered into force at the end of 1993 and now

Jeffrey A. McNeely is Chief Scientist, IUCN–The World Conservation Union, Biodiversity Policy Coordination Division, Rue Mauverney 28, 1196 Gland, Switzerland (E-mail: jam@iucn.org).

The original version of this paper was presented at the conference "War and Tropical Forests: New Perspectives on Conservation in Areas of Armed Conflict," held on March 31 and April 1, 2000, Yale School of Forestry and Environmental Studies.

[Haworth co-indexing entry note]: "Biodiversity, War, and Tropical Forests." McNeely, Jeffrey A. Co-published simultaneously in *Journal of Sustainable Forestry* (Food Product Press, an imprint of The Haworth Press, Inc.) Vol. 16, No. 3/4, 2003, pp. 1-20; and: *War and Tropical Forests: Conservation in Areas of Armed Conflict* (ed: Steven V. Price) Food Products Press, an imprint of The Haworth Press, Inc., 2003, pp. 1-20. Single or multiple copies of this article are available for a fee from The Haworth Document Delivery Service [1-800-HAWORTH, 9:00 a.m. - 5:00 p.m. (EST). E-mail address: getinfo@haworthpressinc.com].

has nearly 180 State Parties, offers a useful framework for such cooperation. [Article copies available for a fee from *The Haworth Document Delivery Service*: 1-800-HAWORTH. E-mail address: <getinfo@haworthpressinc.com> Website: <<http://www.HaworthPress.com>> © 2003 by *The Haworth Press, Inc.* All rights reserved.]

KEYWORDS. Tropical forest, large mammals, biodiversity, war, indigenous people, frontiers

INTRODUCTION

The “peace dividend” expected from the end of the Cold War has not paid off in terms of reduced violent conflict, and the recent nuclear weapons tests by India and Pakistan demonstrate the continuing potential for highly destructive war. Some tropical countries are facing generalized lawlessness and banditry, including by marauding ex-soldiers in several African nations and drug cartels in some parts of Latin America (Renner 1996). Tension in various parts of Africa, Central America, Indonesia, Colombia, Sri Lanka, and elsewhere are further indications of war as a fact of modern life in tropical many forest countries.

Despite these widespread threats to national sovereignty, governments are obliged under the 1992 Convention on Biological Diversity to conserve their own biodiversity (Article 1) and to ensure that activities within their jurisdiction or control do not cause damage to the environment of other states (Article 3). Any negative impacts of war on biodiversity clearly are contrary to this international agreement. But what, specifically, are the impacts of war on biodiversity in tropical forest countries? This paper attempts to identify some of the key issues in preparing a balanced assessment.

The issues are complicated and the available evidence does not provide simple answers. However, it is hard to avoid the conclusion that various trends will make future wars extremely destructive for both people and the rest of nature. Some of the most influential factors include modern means of communication, growing human populations and levels of resource consumption, increased vulnerabilities of interdependent, integrated civil societies, and the spread of modern instruments of war.

On the other hand, war is often seen as part of the way human societies adapt to changing conditions (see, for example, Harris 1974; Keeley 1996; Vayda 1974). The International Commission on Peace and Food

(1994) concluded that historically, all the major changes in the international political and security system have been the result of armed conflicts, wars, and revolutions. It appears that many, even most, societies have been defined by war, and that the organization of a society for the possibility of war has been its principal political stabilizer. The victors who emerged from the ashes of war have sown the seeds that would produce subsequent tensions, disputes, and conflicts. It often seems that an institutional lack of capacity to adapt to change, or the inertia of vested interests in the *status quo*, means that societies inevitably become maladapted, eventually requiring a shock such as war to set them on a different course (Edgerton 1992).

A fundamental issue is how humans stay within the productive limits of their supporting ecosystem. While most would agree that such adaptation should be possible through the application of knowledge and wisdom, history does not support such a rational view, and in fact war is virtually universal in human societies as a means of resolving conflicts arising from various sources of maladaptation (Keeley 1996). Underlying stress factors can produce or deepen rifts in societies, with disputes triggered by glaring social and economic disparities and exacerbated by the growing pressures of resource depletion, natural calamities, environmental degradation, and perceived excess population. Biodiversity-related problems like desertification, soil erosion, deforestation, and water scarcity reduce food-growing potential, worsen health effects, and diminish life-support capacity, which can lead to civil conflict and increase the likelihood of war. Based on experience in Nicaragua, Nietschmann (1990a, 37) concludes, "Degraded land and resources are as much a reason for taking up arms as are repression, invasion, and ideology."

Because environmental stress can be a fundamental cause of armed conflict, issues of biodiversity conservation, the sustainable use of biological resources, and the fair and equitable sharing of the benefits of such uses—the three objectives of the Convention on Biological Diversity—are critical elements in discussions of national security in tropical forest countries. Investments in such activities as sustainable forestry, water conservation, land reform, and protected areas management, it can be argued, are vital contributions to peace.

This paper will begin by briefly assessing war as one of the traditional social means for human societies to adapt to changing environmental conditions, then assess some of the positive and negative impacts of war on tropical forest biodiversity. It then suggests several issues that must be addressed if modern civilization is to meet the growing security

challenges of the 21st century. It will conclude by showing how conserving biodiversity can contribute to peace, building on the preamble to the Convention on Biological Diversity, which states that, "Ultimately, the conservation and sustainable use of biological diversity will strengthen friendly relations among states and contribute to peace for humankind."

THE HISTORY OF WAR AND BIODIVERSITY

Today's biodiversity is to a considerable extent the result of long-term interactions between people and their environments reaching back at least as far as the origins of fire (see, for example, Flannery 1994; McNeely 1994; Martin and Klein 1984; Ponting 1992). The greatest diversity of terrestrial species today is found in forested areas inhabited by tribal and other indigenous peoples, where relatively large areas of "unoccupied" territory serve as a sort of buffer zone between communities that may be embroiled—at least historically—in virtually constant warfare, including sneak attacks, revenge killings, kidnappings, and raids on livestock (Keeley 1996). It is instructive, therefore, to briefly examine the impact on biodiversity of warfare among traditional and indigenous societies, how modern armies relate to tropical forest-dwelling tribal peoples, and the influence such relations have had on biodiversity.

Ember and Ember (1992) found that higher frequencies of war in traditional societies can be forecast by a history of unpredictable natural disasters and severe food shortages, as people have tried to protect themselves by going to war to take resources from enemies. Raids often included plundering food stores and gardens in the Americas, Polynesia, New Guinea, and Africa, leaving an enemy facing starvation and rendering large areas of territory at least temporarily uninhabitable. While this could serve to provide larger areas of habitat to various species of wildlife, it could also lead to significant increases in the pressure of human population on the remaining wildlife populations. Losses and gains of territory were a very frequent result of warfare among pre-industrial societies, leading to dynamic tribal boundaries; and these frontiers often were places supporting great diversity of species. Keeley (1996, 112) concludes, "Even in situations where no territory exchanges hands, active hostilities along a border can lead to development of a no-man's-land, as settlements nearest an enemy move or disperse to escape the effects of persistent raiding. Although such buffer zones

could function ecologically as game and timber preserves, they were risky to use even for hunting and wood cutting because small isolated parties or individuals could easily be ambushed in them.”

These buffer zones often are where biodiversity is richest, especially in terms of large mammals. Consider as just one example, South America at the time of the first contact with Europeans. Large settled villages were found along the major rivers in various parts of the Amazon. The chieftains of these societies practiced a type of warfare that often involved forces numbering in the hundreds of men drawn from multiple confederated villages who traveled by canoes and used sophisticated tactics to attack their enemies. The powerful chieftains often fought over territory, with large buffer zones separating them; these buffer zones often were refugia for wild game (Ferguson 1989b). In the first voyage up the Amazon's Ucayali River in 1577, Juan Salenas Deloyola contacted three principal groups, similar in culture but speaking different languages (an indication of linguistic separation). A distance of 50 to 60 leagues separated each group from the next, about the same distance as was incorporated in the tribal territory. Myers (1979) considers this an example of a no-man's land, located between the defended territories of adjacent human groups. While the evidence available at present does not support any particular conclusions about the relationship between ecology and war, competition for environmental resources very frequently is a factor in war between different communities in Amazonia (Ferguson 1989a). Vulnerability to attack may set a threshold on settlement size, or the threat of raids may encourage people to live together to maintain an adequate defensive force.

Warfare between modern and traditional societies has often involved what might be termed “ecological attacks.” As one of the most obvious examples of this, the final destruction of the great herds of American bison (*Bison bison*), the foundation of Plains Indian life in North America, closely coincided with the defeat of the Sioux and Cheyenne in the 1870s. Biological warfare was also used, either accidentally or intentionally. Diseases such as smallpox, measles, and influenza had a major impact on the native populations of the Americas, Australia, and the Pacific Islands because they lacked immunity to the “new” diseases. Perhaps more important, the Europeans also brought ecological transformations that disrupted traditional economies and replaced native ecosystems with new agricultural systems that produced more of the goods required by colonists (Crosby 1986), leading to fundamental—and perhaps permanent—changes in biodiversity.

One of the world's biologically richest areas is in the upper Amazon, including Venezuela, Colombia, and Brazil: a true "biodiversity hotspot" (McNeely et al. 1990), where borders are not well demarcated. Perhaps not coincidentally, this is also an area that is occupied by a large number of culturally distinct Indian groups that have formed long-term relationships with their environment. These relationships included elements such as warfare, infanticide, and raiding, that are unacceptable in modern society (except, of course, where they are sanctioned by the government as part of modern warfare). For example, Chagnon (1988) has found that among the Yanomamo Indians, the largest Indian group in the Amazon rainforest, 44% of males 25 or older have participated in the killing of someone, about 30% of adult male deaths are due to violence, and nearly 70% of all adults over 40 have lost a close genetic relative due to violence. The relationship between indigenous peoples, biodiversity, colonists, and the modern military in this frontier region is a complex and fascinating one that contains several important lessons for those seeking better understanding of the relationship between biodiversity and national security in tropical forest countries.

In November 1981, Brazil's President Fernando Collor de Melo issued a decree to give the Yanomamo partial control of their traditional lands. The decree was opposed by the Brazilian military, because the Yanomamo lands extend across the borders with Venezuela and Colombia, a militarily sensitive area. The decree was part of a zoning process which involved dividing the forest into protected areas, land for traditional Indian farming and hunting, and areas permitting environmentally destructive development such as logging, roads, mines, and dams.

However, the Brazilian military has continued to impede full legalization of Indian land rights near its international borders, branding as subversives those scientists who are working internationally to save the Amazonian forest habitats of the indigenous peoples. Lewis (1990) reported on a secret document prepared by the Brazilian High War College proposing that war could be used against indigenous or environmental organizations in the Amazon. The idea that the Amazon might be invaded by a foreign army of conservationists aiming to conserve the rainforest may appear ludicrous to those living outside South America, but it is taken seriously in the region and has been used to justify the Brazilian military's tight control of Amazonian policy (Conklin and Graham 1995).

Conselho Indigenista Mission (CIMI) concludes that the Brazilian military sees the preservation of the rainforest and its peoples as a threat

to national security (CIMI 1987), considering it necessary to “clean” the frontier strip of obstacles to the implantation of more permanent investments, which spells disaster for the Indians and for biodiversity. This perception perpetuates the conflict among the military, indigenous peoples, and conservation interests.

This military mind-set is not confined to Brazil. In Venezuela, a proposal to create a Yanomamo Biosphere Reserve along the border with Brazil was rejected by the Ministry of External Relations, concerned that national and international public opinion would be mobilized to seek the human rights of the indigenous groups and to promote eventual self-development and self-determination. The ministry singled out a group of Venezuelan ecologists and anthropologists as the core of an international conspiracy to undermine the ability of the government to control the Amazon territory and its native inhabitants (Hill 1994). The high-level Congress of the Armies of the Americas (CAA) used a number of distortions to reduce complex social problems into a black and white opposition between “national security” and “terrorist subversion,” with those advocating Indian rights being linked to subversive organizations (a group that also included feminists and environmentalists). In essence, the CAA created a mythological history of the relationships between indigenous peoples and their land. It defined problems in terms that required military solutions (Hill 1994), ignoring the role of indigenous ways of life in maintaining the rich biodiversity of the upper Amazon, and their dependence of the forest-dwelling people on the biological resources of the forest.

New Guinea is a tropical forest-covered island that has been a particularly fertile ground for the study of war, as warfare has been frequent, deadly, and a defining factor in the life of most tribal peoples of the island during the time anthropologists were available to study its highly diverse societies (over 700 languages are known from New Guinea). For example, warfare among the Maring, a people of the New Guinea Highlands, facilitated demographic shifts, adjusted relationships between population and land, and alternated the build up of pig herds with slaughter for pig feasts that played an important role in warfare. Rappaport (1984) saw warfare as part of a self-regulating ecological system that maintained the population of both people and pigs below the carrying capacity of the land. Some of the New Guinea highland cultures have particularly bloody histories. For example, the Mae Enga fought 41 wars for land between 1900 and 1950, of which six resulted in complete routs of the enemy that led to acquisition of new territory from the defeated clan (Meggitt 1977). Among the Dani people of the New Guinea

Highlands, warfare is responsible for almost 30% of mortality (Heider 1970). Warfare in association with hunting has been well documented among a number of other New Guinea groups, including the Purari, the Kiwai, the Trans-Fly peoples, the Marind-Anim, the Kolopom, Jacquia, and the Asmat.

Generally speaking, the New Guinea tribes engage in two rather different kinds of warfare. One is highly ritualistic, involving hundreds of men who meet in a designated public battleground and shoot arrows at each other; these battles tend to be generally inclusive and casualties are low. The other kind of warfare is more secular, brief, and infrequent. It often involves a large-scale clandestine attack that kills large numbers of people and destroys property (Shankman 1991). Some battles lead to massacres of over 100 people in an hour or so (Blick 1988), which can amount to over 5% of the group's population (an impact equivalent to 14 million Americans dying). Heider (1979) sees New Guinea warfare as a cycle of battles and raids over many years that constantly splits alliances and rearranges confederations, thus setting the stage for subsequent battles. The result of such fighting is that fields and home sites are abandoned, thereby redistributing land and other resources, and creating buffer zones that provide sanctuary to at least some components of biodiversity.

Indigenous warfare was prevalent throughout Melanesia, and anthropological accounts of pre-colonial warfare come from the Admiralty Islands, New Ireland, New Britain, Bougainville, Choiseul Island, New Georgia, Malaita, San Cristoval, New Hebrides (now Vanuatu) and New Caledonia, and both coastal and interior New Guinea (summarized in Knauff 1990).

While the existence or intensity of warfare in pre-state societies is not a simple linear function of population density, population pressure, or protein scarcity, all of these factors are important contributors. It seems reasonable to conclude that ecological pressure works together with cultural and political dispositions toward warfare. The perception of individual or group land scarcity is a function of sociocultural as well as ecological organization, and perceptions of scarcity are often as important as the pattern of rainfall, the numbers of pigs, or the game animals in the forest (Knauff 1990). Thus, the actual warfare carried out by the indigenous peoples of the tropical forests involved numerous factors reinforcing each other, including increasing human population density, related clearance of forests to increase domestic food production, and declining wild food resources. The concomitant rise in the demand for

resources led to increased opportunities for conflict. It is certain that the subsequent population redistribution had implications for biodiversity.

To conclude this section, it appears that various forms of war have been part of the way traditional societies adapted to changing conditions, and—at least coincidentally—helped contribute to the rich biodiversity found today in many tropical forest areas occupied by traditional and indigenous peoples. Bringing peace to these regions will remove this means of adaptation, requiring other ways to conserve biodiversity and maintain the capacity to adapt to changing conditions.

THE IMPACTS OF WAR ON BIODIVERSITY IN TROPICAL FORESTS

Negative Impacts of War on Biodiversity

The negative impacts of war on biodiversity in tropical forests result from the collective actions of large numbers of people for whom war is a dispensation to ignore normal restraints on activities that cause environmental damage. War, and preparations for it, have negative impacts on all levels of biodiversity, from genes to ecosystems. These impacts can be direct—such as hunting and habitat destruction by armies—or indirect, for example through the activities of refugees.

Sometimes these impacts can be deliberate, and a new word has been added to the military vocabulary: “ecocide,” the destruction of the environment for military purposes; it clearly builds on the “scorched earth” approach of earlier times. Westing (1976) divides deliberate environmental manipulations during wartime into two broad categories: those involving massive and extended applications of disruptive techniques to deny to the enemy any habitats that produce food, refuge, cover, training grounds, and staging areas for attacks; and those involving relatively small disruptive actions that in turn release large amounts of “dangerous forces” or become self-generating. An example of the latter is the release of exotic micro-organisms or spreading of landmines (of which over 100 million now litter active and former war zones around the world) (Strada 1996).

This discussion could be long and dreary, but only a few illustrative cases will be mentioned. Perhaps the most outstanding example is Vietnam, where US forces cleared 325,000 ha of land and sprayed 72,400 m³ of herbicides in the name of security (Westing 1982). The impact on biodiversity was severe; spreading herbicides on 10% of the country