



## PROTECTING NATURE'S PHARMACY

### How natural areas, plants, and animals around the globe help us fight disease

Tropical rainforests, coral reefs and natural areas provide the ingredients for drugs that help people survive cancer, heart disease, diabetes and other serious health threats. But development and other factors have reduced many natural ecosystems around the world by more than half their original extent. As they disappear, so do the plants and animals living there.

#### NATURE'S DRUG STORE

Half of the new drugs created in the past 25 years have an ingredient derived from nature.<sup>1</sup> More remarkably, over 70 percent of all cancer drugs are based on natural compounds.<sup>2</sup>

In addition to their health benefits, prescription drugs are a major engine of U.S. economic growth and an important area where the U.S. continues to lead the world. By 2011 the U.S. is expected to produce 38 percent of all pharmaceuticals.

But when natural areas are destroyed and species are driven to extinction, complex organic compounds potentially valuable for medicine are lost forever. The United Nations Environment Programme predicts current extinction rates will result in the loss of one major new drug every two years.<sup>3</sup>

Most of the world's species live in developing countries, but lacking the tools and funds to protect their ecosystems, these nations face the highest rates of species loss.



Some medicines originally derived from species in these disappearing ecosystems include:

- **EXENATIDE**—a diabetes drug synthesized from the saliva of the Gila monster, a lizard found in northern Mexico and the southwestern U.S.<sup>4</sup> These lizards are increasingly rare because of habitat destruction.<sup>5</sup>
- **RESERPINE**—synthesized from the snakeroot plant native to India, Indonesia, South America and Africa, this was the first drug to control hypertension.<sup>6</sup> Unraveling Reserpine's biochemistry has led to new and improved hypertension medications. Extensive deforestation is wiping out snakeroot habitats in Indonesia.<sup>7</sup>
- **CYTOSINE ARABINOSIDE and ADENINE ARABINOSIDE**—anticancer and antiviral drugs both isolated from the Caribbean sea sponge.<sup>8</sup> Caribbean Sea habitats are threatened by pollution and overfishing.
- **CALANOLIDE A**—a potent anti-HIV compound isolated from the sap of a rainforest tree in Borneo.<sup>9</sup> The tree was nearly driven to extinction by logging until its status as a potential new drug source resulted in its protection.<sup>10</sup>
- **PEPTIDES** produced in the skin of some Amazon frogs can kill the HIV virus as well as certain types of cancer cells. These frogs are plagued by habitat loss and disease, threatening many species with extinction.<sup>11</sup>

## THE ALLIANCE FOR GLOBAL CONSERVATION

A coalition of major international conservation organizations is working with medical experts, disease survivors and their families in support of the Global Conservation Act. The Act will help conserve the developing world's rapidly disappearing natural areas that provide habitat for plants and animals, livelihoods for local communities, and pharmaceutical ingredients that save lives.



## THE GLOBAL CONSERVATION ACT WILL:

- Establish a comprehensive global conservation strategy for the U.S. government that significantly improves the effectiveness of our conservation assistance to developing countries.
- Identify a White House coordinator for global conservation.
- Direct U.S. diplomats to transform the U.S. strategy into a global partnership including all developed countries.



<sup>1</sup> Chin, Y-W, M.J. Balunas, H.B. Chai, and A. D. Kinghorn. 2006. Drug Discovery from Natural Sources, *The American Association of Pharmaceutical Scientists Journal*, 8 (2) p 239-253.

<sup>2</sup> David J. Newman and Gordon M. Cragg 2007. Natural products as sources of new drugs over the last 25 years. *Journal of Natural Products*, 70, pp. 461-477.

<sup>3</sup> Brian Groombridge and Martin D. Jenkins, *World Atlas of Biodiversity: Earth's Living Resources for the 21st Century*, United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC), University of California Press, 2002.

<sup>4</sup> Chin, Y-W, M.J. Balunas, H.B. Chai, and A. D. Kinghorn. 2006. Drug Discovery from Natural Sources, *The American Association of Pharmaceutical Scientists Journal*, 8 (2) p 239-253.

<sup>5</sup> Hammerson, G.A., Frost, D.R. & Gadsden, H. 2007. *Heloderma suspectum*. In: IUCN 2009. IUCN Red List of Threatened Species. Version 2009.2. www.iucnredlist.org. Downloaded on 03 March 2010.

<sup>6</sup> Paul Alan Cox, Biodiversity and the search for new medicines, In *Biodiversity Change and Human Health: From Ecosystem Services to Spread of Disease*, Osvaldo E. Sala, L.A. Meyerson, and C. Parmesan (editors), Island Press, Washington D.C., 2009.

<sup>7</sup> National Tropical Botanical Garden, *Rauvolfia serpentina* (Apocynaceae), www.ntbg.org/plants/plant\_details.php. Downloaded 03 March 2010.

<sup>8</sup> Chin, Y-W, M.J. Balunas, H.B. Chai, and A. D. Kinghorn. 2006. Drug Discovery from Natural Sources, *The American Association of Pharmaceutical Scientists Journal*, 8 (2) p 239-253.

<sup>9</sup> Gordon M. Cragg and David J. Newman 2005. Biodiversity: A continuing source of novel drug leads, *Pure Applied Chemistry*, Vol. 77, No. 1, pp. 7-24.

<sup>10</sup> "Anti-HIV drug from rainforest almost lost before its discovery," Rhett A. Butler, mongabay.com September 13, 2005, <http://news.mongabay.com/2005/0913-AIDS.html>. Downloaded 03 March 2010.

<sup>11</sup> Karen Lips, "Save the frogs - and perhaps ourselves," Baltimore Sun, September 1, 2009.