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NEW LEADERSHIP NEEDED: THE CONVENTION ON BIOLOGICAL DIVERSITY

ABSTRACT

The Convention on Biological Diversity (CBD) endorses an international effort to protect and sustain Earth's biological resources. The 20th century marks the most massive global extinction in Earth's history, one that is inextricably connected to the human fingerprint. The CBD addresses this global issue by incentivizing the protection of genetic resources and by endorsing equitable sharing of biological information. The CBD, while well intentioned, has not made large strides in reversing global biodiversity loss. This Comment reflects on how the CBD has failed to stabilize the decline of biological diversity and urges the United States, a global powerhouse, to finally ratify the Convention. This Comment argues that the CBD should amend itself and approach the problem in new ways—by adding a new enforcement mechanism and by creating two new protocols that target specific global pressures on biodiversity. A new enforcement mechanism should model that of the Montreal Protocol's, the most successful international environmental treaty. The first new protocol should address the global pressure of climate change by focusing on methane emissions from livestock production. The second new protocol should address the global pressure of habitat degradation by instituting a cap and trade system designed to combat deforestation. The addition of sanctions and new protocols could vastly improve the success of the Convention and efficiently address global loss of biodiversity.

INTRODUCTION

The Convention on Biological Diversity (CBD) and its accompanying protocols endorse an international effort to protect and sustain Earth's biological resources for future generations.¹ The 20th century marked the most massive global extinction in Earth's history,² and “[w]hat distinguishes

¹ *History of the Convention*, CONVENTION ON BIOLOGICAL DIVERSITY, <https://www.cbd.int/history/> (last visited Oct. 7, 2016) [hereinafter *History of the CBD*].

² *See All Creatures Great and Small*, ECONOMIST (Sept. 14, 2013), <http://www.economist.com/news/special-report/21585091-biodiversity-once-preoccupation-scientists-and-greens-has-become-mainstream>

present-day extinctions from those that have occurred in the past is a distinctive human fingerprint.”³ While determining extinction rates for all species is complex, scientists have successfully determined extinction rates of birds and mammals because of their recognizable skeletal remains.⁴ Background extinction rates would have the extinction of one species every four hundred years; bird and mammal species currently average an extinction of 20-25 species every 100 years.⁵ This makes the current rate of species extinction one thousand times the natural expected rate.⁶ The CBD addresses this rapid loss of biodiversity by attacking the problem in a unique way—by incentivizing the protection of genetic resources and the equitable sharing of information.⁷ The CBD, while well-intentioned, has not made significant strides in reversing global biodiversity loss.⁸ The treaty needs new leadership and amendments in order to effect change in a way that its drafters intended. The United States, as a global powerhouse, should ratify and amend the CBD and take charge as an international leader in the conservation of biodiversity.

The structure of this Comment reads as follows. Part I of this Comment explores the CBD, including its historical development, the U.S. response, and the two current protocols to the convention. Part II examines the value of biodiversity, current threats to biodiversity, and illustrates why the conservation of biodiversity is necessary for both economic and ethical reasons. Part III discusses the CBD’s growing need for leadership and examines how the United States is in a unique position to affect that

(“Ever since man first picked up a spear, other species have suffered. Man wiped out most of the megafauna—the mammoths, the sabre-toothed tigers, the mastodons, the aurochs—that roamed the planet before he did. When he sailed the Pacific, he killed off half the bird species on its islands. As his technology improved, so his destructive power increased. When he learned how to exploit the Earth’s minerals and hydrocarbons, he started to multiply ever faster, leaving ever less room for the planet’s other species. He chopped down forests, poisoned rivers and killed large numbers of the biggest sea fish and marine mammals. Many believe that, as a result, a mass extinction comparable to those of prehistoric times may be under way.”)

³ Eric Chivian & Aaron Berstein, *How Is Biodiversity Threatened by Human Activity?*, in *SUSTAINING LIFE: HOW HUMAN HEALTH DEPENDS ON BIODIVERSITY* (Eric Chivian & Aaron Bernstein eds., Oxford University Press 2008), <http://churchandstate.org.uk/2011/02/sustaining-life-how-human-health-depends-on-biodiversity/>.

⁴ CONVENTION ON BIOLOGICAL DIVERSITY, GLOBAL BIODIVERSITY OUTLOOK 1, 70 (2010), <https://www.cbd.int/gbo1/chap-01-02.shtml>.

⁵ *Id.* at 70–71.

⁶ Harrison Ford, Opinion, *We Must Act Decisively to Save Our World*, CNN (Oct. 28, 2010), <http://www.cnn.com/2010/OPINION/10/28/harrison.ford.biodiversity/>.

⁷ Convention on Biological Diversity arts. 11, 17, June 5, 1992, 31 I.L.M. 818 [hereinafter CBD].

⁸ David Ritter, *Convention on Biological Diversity a Ten Year Failure*, GLOBAL POL’Y J. (Aug. 26, 2010), <http://www.globalpolicyjournal.com/blog/26/08/2010/convention-biological-diversity-ten-year-failure>.

leadership. Part III also compares the CBD with the Montreal Protocol and the Kyoto Protocol.

Finally, Part III suggests amendments to the Convention on Biodiversity that the United States is in a prime position to make. These amendments include a new enforcement mechanism, which mirrors that of the Montreal Protocol, and two new protocols. The suggested protocols, unlike the current protocols, target identified global pressures on biodiversity. The first suggested protocol deals with the pressure of climate change, by focusing on methane emissions from livestock production. The second suggested protocol deals with the pressure of habitat degradation by narrowly tailoring a cap and trade system to combat deforestation.

I. THE CONVENTION ON BIODIVERSITY

In recognition of the imminent threat human activities pose to Earth's biological resources, the international community promulgated a treaty aimed at mitigating these threats.⁹ As is noted on the website dedicated to the Convention on Biodiversity, "the Earth's biological resources are vital to humanity's economic and social development."¹⁰ The United Nations Environment Programme (UNEP) is the leading international authority that seeks to advance sustainable development and advocate for the wellbeing of our global environment.¹¹ In 1972, UNEP was formed pursuant to U.N. General Assembly Resolution 2997.¹² UNEP prioritizes seven intersecting global environmental themes: climate change, disasters and conflicts, ecosystem management, environmental governance, chemicals and waste, resource efficiency, and the environment under review.¹³

In 1988, UNEP convened the Ad Hoc Working Group of Experts on Biological Diversity "to explore the need for an international convention on biological diversity."¹⁴ This group later developed into an established group of

⁹ *See id.*

¹⁰ History of the CBD, *supra* note 1.

¹¹ *Mission*, U.N. ENV'T PROGRAMME, <http://www.unep.org/about/> (last visited Oct. 7, 2016).

¹² *See* G.A. Res. 2997 (XXVII) (Dec. 15, 1972); U.N. Conference on the Human Environment at Stockholm, U.N. Doc. A/Conf.48/14/Rev.1 (June 5–16, 1972) (the Stockholm Convention being one of the first international conferences on environmental issues); Paul Roberts, *International Funding for the Convention of Biological Diversity: Convention on Biological Diversity*, 10 B.U. INT'L L.J. 303, 303 (1992).

¹³ *UNEP Priorities*, U.N. ENV'T PROGRAMME, <http://www.unep.org/about/Priorities/tabid/129622/Default.aspx> (last visited Oct. 7, 2016).

¹⁴ *History of the CBD*, *supra* note 1.

experts charged with the responsibility of creating an “international legal document for the conservation and sustainable use of biological diversity.”¹⁵ This international legal document laid the foundation for the CBD.¹⁶

UNEP adopted the CBD on May 22, 1992 and it entered into force as international law on December 29, 1993.¹⁷ Thus far, 196 states have ratified the Convention, which includes all states but the United States and the Holy See.¹⁸ The CBD has three main objectives, as stated in the text of Article I: “(1) the conservation of biological diversity, (2) the sustainable use of its components, and (3) the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.”¹⁹ The Convention’s text contains forty-two articles and two annexes.²⁰ The text broadly asserts that contracting parties must color their national decisions with conservation and sustainable use ideals,²¹ educate the public on the threats to biodiversity,²² and equitably share information, biotechnology, and financial resources with all states while taking into special consideration the needs of developing nations.²³

Not only must states ratify the Convention, but they must also implement it within their borders. Practically speaking, the implementation may be synthesized into four basic steps: “first, develop national strategies for conservation. [Second], establish a system of protected areas. [Third], begin to rehabilitate damaged ecosystems [and finally], integrate the consideration of conserving biological resources into national decision-making.”²⁴ The CBD is both a trade agreement and a conservation agreement;²⁵ in addition to setting

¹⁵ *Id.*; see Rep. of the Ad Hoc Working Group of Legal and Technical Experts on Biological Diversity on the Work of Its Second Session, U.N. Doc. UNEP/Bio.Div/WG.2/2/5 (Mar. 7, 1991).

¹⁶ *History of the CBD*, *supra* note 1.

¹⁷ David J. Schnier, *Genetically Modified Organisms and the Cartagena Protocol*, 12 FORDHAM ENVTL. L. REV. 377, 399–400 (2001).

¹⁸ *List of Parties*, CONVENTION ON BIOLOGICAL DIVERSITY, <https://www.cbd.int/information/parties.shtml> (last visited Oct. 7, 2016).

¹⁹ CBD, *supra* note 7, art. 1.

²⁰ Robert F. Blomquist, *Ratification Resisted: Understanding America’s Response to the Convention on Biological Diversity, 1989–2002*, 32 GOLDEN GATE U. L. REV. 493, 497 (2002).

²¹ CBD, *supra* note 7, art. 10.

²² *Id.* art. 13.

²³ *Id.* art. 15–21.

²⁴ *The Convention on Biological Diversity: Hearing Before the Comm. on Foreign Relations*, 103d Cong. 3 (1994).

²⁵ David R. Downes, *The Convention on Biological Diversity: Seeds of Green Trade?*, 8 TUL. ENVTL. L.J. 163, 165 (1994).

sustainability standards, it establishes the basic terms of trade of Genetic resources.²⁶

Genetic resources, as defined in Article 2 of the CBD, are genetic material of actual or potential value.²⁷ Genetic resources serve as the raw material for many valuable biotech products, from pharmaceuticals to genetically modified crops.²⁸ The rise of biotechnology has led to an expansive view of intellectual property rights, which now extend over some genetic resources that have been genetically altered by humans.²⁹ These intellectual property rights conferred by patent provide “incentive for research and development and promote the diffusion of ideas and information.”³⁰ Missing, however, are analogous incentives for the preservation and development of naturally existing genetic resources, which in turn serve as building blocks for later genetically modified products.³¹ Some say this lack of analogous incentives creates an inequity for “traditional farmers and indigenous peoples [who] cannot protect their own current or historical investment in informal innovation and conservation.”³² The CBD seeks to remedy this inequity by requiring contracting states to provide incentives for the conservation and sustainable use of components of biological diversity.³³

A. *The U.S. Response*

Although a signatory, the United States did not ratify the CBD, an omission that seemed wholly inconsistent with its historical policy stance on

²⁶ *Id.* at 164.

²⁷ CBD, *supra* note 7, art. 2.

²⁸ Downes, *supra* note 25, at 164. However, there are differences in opinion on the patenting of human genes: the United States has a “split-the-baby approach” to patenting genes. The result of *Myriad*, a U.S. case about patenting human DNA, rendered isolated DNA not patentable and complementary DNA patentable. Michael Cronin, *U.S. Supreme Court Splits the Baby in Myriad Genetics*, WTNNEWS (June 25, 2013), <http://wtnews.com/articles/10657/>.

²⁹ Intellectual property rights provide private ownership over genetically modified organisms. See Downes, *supra* note 25, at 168; see generally *Diamond v. Chakrabarty*, 447 U.S. 303 (1980); Haley Stein, *Intellectual Property and Genetically Modified Seeds: The United States, Trade, and the Developing World*, NW. J. TECH. & INTELL. PROP. 160 (2005).

³⁰ Kristina Lybecker, *How to Promote Innovation: The Economics of Incentives*, IPWATCHDOG (July 21, 2014), <http://www.ipwatchdog.com/2014/07/21/promoting-innovation-the-economics-of-incentives/id=50428/>.

³¹ Downes, *supra* note 25, at 168.

³² *Id.* Some countries also require that a patent applicant disclose the geographic origin of any genetic or traditional knowledge that helped develop the invention in the patent application. U.N. Conference on Trade and Development, *The Convention on Biodiversity and the Nagoya Protocol: Intellectual Property Implications*, U.N. Doc. UNCTAD/DIAE/PCB/2014/3, at 48 (2014).

³³ CBD, *supra* note 7, art. 11.

biodiversity³⁴ and its great tradition of public engagement.³⁵ In 1973, the United States became a global front-runner in the protection of biodiversity by passing the Endangered Species Act, which has been a model for other species protection efforts around the world.³⁶ In 1991, President George H. W. Bush addressed Congress stating:

Our efforts to enhance the quality of the domestic environment must be accompanied by comparable efforts toward global environmental quality. In these times, Americans are aware that our political and economic security is affected by actions occurring abroad. Likewise, we know that environmental threats do not stop at a line on a map. In the months and years ahead, *we need to broaden our dialogue with other nations and international institutions and together address environmental issues that know no boundaries.*³⁷

Ironically, it was the United States that promoted creating a biodiversity treaty in the 1980s and engaged in many of the negotiations leading up to its promulgation.³⁸ In 1993, President Bill Clinton strongly endorsed ratifying the CBD, noting that because of the strong U.S. environmental programs already in place, it would not be necessary to implement new programs that comply with the Convention.³⁹

The reason why the United States ultimately did not ratify the CBD is a matter of speculation, but likely stemmed from a desire to defend domestic lucrative biotechnology industries.⁴⁰ Senator Don Nickles, a strong opponent to ratification, opined that the United States did not ratify the CBD because of its treatment of intellectual property rights, pointing specifically to Article 16.⁴¹ Article 16 of the CBD lays out broad principles regarding access to and transfer of technology between states in order to facilitate the goals of the

³⁴ See generally Blomquist, *supra* note 20.

³⁵ See William J. Snape, III, *Joining the Convention on Biological Diversity: A Legal and Scientific Overview of Why the United States Must Wake Up*, 10 SUSTAINABLE DEV. L. & POL'Y 6, 6 (2010) [hereinafter Snape, *Joining the CBD*].

³⁶ *The Convention on Biological Diversity: Hearing before the Comm. on Foreign Relations, supra* note 25, at 2; Blomquist, *supra* note 20, at 494.

³⁷ Message to the Congress Reporting on Environmental Quality, 1 PUB. PAPERS 404, 405 (Apr. 18, 1991) (emphasis added).

³⁸ Snape, *Joining the CBD, supra* note 35, at 11.

³⁹ Message to the Congress Transmitting the Convention on Biological Diversity, 2 PUB. PAPERS 2029, 2029–30 (Nov. 19, 1993).

⁴⁰ Blomquist, *supra* note 20, at 524–25. “There are also clauses that the Administration believes threaten the protection of patents and intellectual property rights.” Opinion, *Not-So-Bad Boy of Biodiversity*, N.Y. TIMES (June 5, 1992), <http://www.nytimes.com/1992/06/05/opinion/not-so-bad-boy-of-biodiversity.html>.

⁴¹ Blomquist, *supra* note 20, at 526–27.

treaty.⁴² Paragraph 2 of Article 16 specifically acknowledges that “such access and transfer shall be provided on terms which recognize and are consistent with the adequate and effective protection of intellectual property rights,”⁴³ a clause which seemingly does provide domestic protection to biotech industries, albeit in vague terms. Nickles further explained that ratification of the treaty would lead to massive international trade blockades for the U.S. biotech industry,⁴⁴ giving states “an open invitation to reject United States agricultural products.”⁴⁵ The protection of the world’s biological diversity should be valued more than the protection of lucrative, yet unsustainable, private industries.⁴⁶

Though ratification has not been on the Senate’s agenda since original negotiations in the early 1990s, the United States is not completely disinterested.⁴⁷ The United States remains an observer party state to the CBD, “without an official voice in negotiations or decision-making.”⁴⁸ A U.S. representative also joined the biodiversity conversation at a workshop held in January 2010 to update the CBD’s Post-2010 Strategic Plan.⁴⁹ Later in 2010, just before the Nagoya meeting,⁵⁰ heads of state met at the U.N. headquarters to address challenges of accelerated biodiversity loss and to try to convince the United States to officially join the CBD.⁵¹ As of October 2016, the United States still has not joined the rest of the world as a party state to the CBD.⁵²

B. Later Developments—The Cartagena & Nagoya Protocol

The CBD was followed by two accompanying protocols: 1) The Cartagena Protocol and 2) The Nagoya Protocol.

⁴² CBD, *supra* note 7, art. 16.

⁴³ *Id.*

⁴⁴ Blomquist, *supra* note 20, at 528.

⁴⁵ *Id.*

⁴⁶ See generally *Biodiversity and Its Loss: What Does It All Really Mean*, DO OR DIE, <http://www.eco-action.org/dod/no8/biodiversity.html> (last visited Oct. 7, 2016).

⁴⁷ Kelly Moore Brands, *EM Cheat Sheet: The Convention on Biological Diversity*, ECOSYSTEM MARKETPLACE: A FOREST TRENDS INITIATIVE (May 14, 2010), <http://www.ecosystemmarketplace.com/articles/em-em-cheat-sheet-em-the-convention-on-biological-diversity/>.

⁴⁸ *Id.*

⁴⁹ *Id.*

⁵⁰ See *infra* Part I.B. for a discussion of the Nagoya meeting.

⁵¹ *Id.*

⁵² *List of Parties*, *supra* note 18.

1. *The Cartagena Protocol*

The Cartagena Protocol on Biosafety, adopted on January 29, 2000, provides a framework for dealing with the environmental impacts of bioengineered products that cross international borders, taking into account the risks to human health.⁵³ The Protocol does not aim to regulate bioengineered products for direct human consumption, such as pharmaceuticals⁵⁴ or commodity food items,⁵⁵ rather the protocol aims to regulate living modified organisms (LMO), which are intended to be introduced to the environment. Article 3(g) of the protocol defines LMOs as “any living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology.”⁵⁶ Modern biotechnology includes the introduction of recombinant DNA or a fusion of cells, which exceed the natural capabilities utilized in traditional breeding and selection.⁵⁷ LMOs include agricultural crops that have been genetically modified for greater productivity or for resistance to pests or disease,⁵⁸ such as herbicide tolerant cotton and Bt (*Bacillus thuringiensis*) corn.⁵⁹ Many U.S. agricultural exports are LMOs that would fall within the ambit of the protocol.

The Cartagena Protocol sets forth four key provisions that all party states must adhere to. First, the Protocol’s “Advanced Informed Agreement (AIA) Procedure” effectively requires an importing state to consent to the shipment of an LMO into its territory that is intended for release into the natural environment.⁶⁰ Second, the Protocol established a “Biosafety Clearing-House”

⁵³ Office of the Spokesman, *Fact Sheet: The Cartagena Protocol on Biosafety*, U.S. DEP’T OF STATE (Feb. 16, 2000), <http://www.isaaa.org/kc/Publications/pdfs/documents/Cartagena%20protocol%20on%20biosafety.pdf>. “The objective of this Protocol is to contribute to ensuring an adequate level of protection in the field of the safe transfer, handling and use of living modified organisms resulting from modern biotechnology that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health, and specifically focusing on transboundary movements.” *Cartagena Protocol on Biosafety to the Convention on Biological Diversity* art. 1, Jan. 29, 2000, 2226 U.N.T.S. 208 [hereinafter *Cartagena Protocol*].

⁵⁴ See *Cartagena Protocol*, *supra* note 53, art. 5. “[T]his Protocol shall not apply to the transboundary movement of living modified organisms which are pharmaceuticals for humans that are addressed by other relevant international agreements or organizations.” *Id.*

⁵⁵ *Fact Sheet: The Cartagena Protocol on Biosafety*, *supra* note 53.

⁵⁶ *Cartagena Protocol*, *supra* note 53, art. 3(g).

⁵⁷ *Id.* art 3(i).

⁵⁸ *Id.*

⁵⁹ *Recent Trends in GE Adoption*, U.S. DEP’T OF AGRIC. ECON. RES. SERV. (July 19, 2015), <http://www.ers.usda.gov/data-products/adoption-of-genetically-engineered-crops-in-the-us/recent-trends-in-ge-adoption.aspx>.

⁶⁰ *Cartagena Protocol* *supra* note 53, art. 7.

which serves as a means of facilitating the exchange of information on LMOs.⁶¹ Contracting parties are required to file relevant risk assessment information and decisions regarding domestic LMO use with the Biosafety Clearing-House.⁶² Third, the Protocol sets forth documentation measures and labeling requirements for shipments of LMOs to ensure safe handling, transport, packaging, and identification.⁶³ The shipping package of an LMO (that is intended to be introduced to the environment) must specify that the package contains an LMO and list the specific LMO and relevant traits.⁶⁴ Note, however, that these labeling requirements under the treaty do not extend to goods for direct human consumption.⁶⁵ Finally the Protocol endorses the precautionary approach.⁶⁶

The precautionary approach, often revered as a fundamental principle of international environmental law,⁶⁷ “stands for the proposition that a ‘lack of full scientific certainty should not be used to postpone cost-effective measures to protect the environment against serious or irreversible threats.’”⁶⁸ The principle requires signatory states to regulate activities or substances that may be harmful to the environment, even if there is no conclusive scientific evidence corroborating any negative effects.⁶⁹ The term began gaining popularity in the 1970s when Germany used the principle to fight air pollution. Precautionary thinking, however, can be traced back to as early as 1854, when physician Dr. John Snow employed the principle in an attempt to fight a Cholera outbreak in London.⁷⁰ “At some level of generality, precaution is undoubtedly a customary rule of international law,” but at a micro level, there are various interpretations of its meaning and breadth.⁷¹

⁶¹ *Id.*

⁶² *Fact Sheet: The Cartagena Protocol on Biosafety*, *supra* note 53.

⁶³ Cartagena Protocol, *supra* note 53, art. 18.

⁶⁴ *Id.*

⁶⁵ *Fact Sheet: The Cartagena Protocol on Biosafety*, *supra* note 53.

⁶⁶ Cartagena Protocol, *supra* note 53, art. 18.

⁶⁷ David L. VanderZwaag, *The ICJ, ITLOS, and the Precautionary Approach: Paltry Progressions, Jurisprudential Jousting*, 35 U. HAWAII L. REV. 617, 617 (2013).

⁶⁸ Schnier, *supra* note 17, at 412.

⁶⁹ Linda O’Neil Coleman, *The European Union: An Appropriate Model for a Precautionary Approach*, 25 SEATTLE U. L. REV. 609, 611 (2001–2002).

⁷⁰ WORLD COMM’N ON THE ETHICS OF SCI. KNOWLEDGE, THE PRECAUTIONARY PRINCIPLE (2005), <http://unesdoc.unesco.org/images/0013/001395/139578e.pdf>.

⁷¹ John S. Applegate, *The Taming of the Precautionary Principle*, 27 WM. & MARY ENVTL. L. & POL’Y REV. (2002–2003).

The Cartagena Protocol's use of the precautionary principle marks the first time the principle ever became part of an international treaty's operative provisions.⁷² In the context of the Cartagena Protocol, the approach allows states to deny LMO imports without conclusive scientific evidence that such products are actually harmful to human health or the environment.⁷³ This approach has proved controversial.⁷⁴ States can deny imports based on mere speculative concerns, which may be misinformed or based on faulty science.⁷⁵ General criticisms of the precautionary approach include that the principle is inefficacious, indeterminate, and is employed as an excuse for states to arbitrarily regulate trade.⁷⁶ Willy De Greefe (head of regulatory affairs of Syngenta Seeds) criticized the Protocol as "a poorly informed platform, almost devoid of serious inputs from the field of reputable biotech and biosafety research."⁷⁷

Although these criticisms have merit, in an area of contention as novel, vital, and detrimental as the ongoing loss of our planet's biodiversity, the precautionary principle deserves a spot in the international arena.⁷⁸ The Precautionary Principle is fundamentally a risk-based assessment and is no more vague than the "arbitrary and capricious" standard set by the United States for agency deference.⁷⁹ The D.C. Circuit has held that uncertainty is a highly rational reason to set standards at a higher level until more research becomes available.⁸⁰ The National Academy of Sciences also recommends this approach to "conservative default assumptions in risk assessment."⁸¹ As the ancient adage goes, better safe than sorry.⁸²

⁷² Jonathan H. Adler, *The Cartagena Protocol and Biological Diversity: Biosafe or Biosorry?*, 12 GEO. INT'L ENVTL. L. REV. 761, 763 (2000).

⁷³ Schnier, *supra* note 17, at 392.

⁷⁴ See generally *Bad Science About GMOs: It Reminds Me of the Antivaccine Movement (Revisited)*, SCIENCEBLOGS (June 17, 2013), <http://scienceblogs.com/insolence/2013/06/17/bad-science-about-gmos-it-reminds-me-of-the-antivaccine-movement-revisited/>.

⁷⁵ *Id.*

⁷⁶ Coleman, *supra* note 69.

⁷⁷ Willy De Greef, *The Cartagena Protocol and the Future of Agbiotech*, 22 NATURE PUB. GROUP 811, 811 (2004).

⁷⁸ See generally John Harte, *Land Use, Biodiversity, and Ecosystem Integrity: The Challenge of Preserving Earth's Life Support System*, 27 ECOLOGY L.Q. 929 (2001) (surveying the decline of biodiversity in the United States, exploring its detrimental effects, and advocating for better science and policy to address the problem).

⁷⁹ Applegate, *supra* at 71.

⁸⁰ *Id.*

⁸¹ *Id.*

⁸² Frank B. Cross, *Paradoxical Perils of the Precautionary Principle*, 53 WASH. & LEE L. REV. 851, 861 (1996).

2. *The Nagoya Protocol*

The Nagoya Protocol, adopted on October 29, 2010,⁸³ focuses on implementing the CBD's third goal—the fair and equitable sharing of the benefits arising out of the utilization of genetic resources.⁸⁴ The Nagoya Protocol aims both to set forth more predictable conditions for access to genetic resources and to implement greater benefit-sharing when a genetic resource leaves the country where it was generated.⁸⁵ The benefits mentioned in the Protocol include both monetary and non-monetary benefits, such as the resulting research generated from genetic resources.⁸⁶ The Protocol was developed in response to failing initiatives set forth by the CBD, thereby creating a more comprehensive scheme to achieve these goals.⁸⁷ It was not intended to broaden the scope of the CBD; rather, it was intended to more efficaciously execute the already existing ambitions.⁸⁸

One example of effective implementation of the Nagoya Protocol can be seen in India.⁸⁹ An Indian company exported 2000 kg of Neem Leaves to Japan.⁹⁰ The leaves were collected in Amarchinta village BMC of Mahboobnagar district, Andhara Pradesh.⁹¹ The importers paid a royalty to the company who then transferred a portion of that money to the village for planting Neem samplings and for raising awareness of biodiversity conservation.⁹² Splitting the profits among the company and the village is the type of benefit-sharing the Nagoya Protocol envisions, aiming to incentivize conservation at both general and local levels.⁹³

⁸³ THOMAS GREIBER ET AL., AN EXPLANATORY GUIDE TO THE NAGOYA PROTOCOL ON ACCESS AND BENEFIT-SHARING ix (2012).

⁸⁴ *Id.*

⁸⁵ *About the Nagoya Protocol*, CONVENTION ON BIOLOGICAL DIVERSITY, <https://www.cbd.int/abs/about/default.shtml/> (last visited Oct. 7, 2016).

⁸⁶ *Id.*

⁸⁷ U.N. Conference on Trade & Development, *Implications for BioTrade of the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization*, at 6, U.N. Doc. UNCTAD/DITC/TED/2011/9 (2011).

⁸⁸ *Id.*

⁸⁹ *See generally* Hem Pande, *Implementation of ABS Mechanism in India*, CONVENTION ON BIOLOGICAL DIVERSITY, <https://www.cbd.int/doc/meetings/fin/ds-fb-02/other/ds-fb-02-presentation-22-en.pdf> (last visited Nov. 14, 2016).

⁹⁰ *Id.* at 17.

⁹¹ *Id.*

⁹² *Id.*

⁹³ *See* Press Release, U.N. Environment Programme, Nagoya Protocol to the Convention on Biological Diversity celebrates two-year anniversary of entry into force, U.N. Press Release 110438 (Oct. 14, 2016) <https://www.cbd.int/kb/record/pressRelease/110438>.

II. BIODIVERSITY

The overarching purpose of the CBD is to conserve biodiversity for future generations. This is because biodiversity is valuable and arguably necessary to sustain human life. This section explains biodiversity and the value it provides, elucidating why signing a treaty like the CBD is of paramount importance.

“All life on Earth is part of one great, interdependent system. It interacts with, and depends on, the non-living components of the planet: atmosphere, freshwaters, rocks, and soils. Humanity depends totally upon this community of life—the biosphere—of which we are an integral part.”⁹⁴ Never in Earth’s history has a species threatened our delicate ecosystem as voraciously as humans.⁹⁵ Sheer (and seemingly unavoidable) population growth exacerbates already existing resource consumption, waste, and environmental degradation issues.⁹⁶ Growing global hunger concerns,⁹⁷ coupled with the Western appetite for a sophisticated quality of life,⁹⁸ have further threatened our environment and Earth’s biodiversity.⁹⁹

Biodiversity is a multifaceted concept best illustrated by taking a comprehensive sampling of a variety of characterizations.¹⁰⁰ Biodiversity is peculiar, as it is simultaneously conventional and novel.¹⁰¹ Though the term and accompanying definitions are relatively contemporary, the concept of species classification and hierarchy has existed in the human mind for generations.¹⁰² The CBD defines biodiversity as “the variability among living

⁹⁴ WORLD RES. INST., GLOBAL BIODIVERSITY STRATEGY: GUIDELINES FOR ACTION TO SAVE, STUDY, AND USE EARTH’S BIOTIC WEALTH SUSTAINABLY AND EQUITABLY at v (1992).

⁹⁵ Roberts, *supra* note 12.

⁹⁶ EUGENE A. ROSA & THOMAS DIETZ, HUMAN FOOTPRINTS ON THE GLOBAL ENVIRONMENT, THREATS TO SUSTAINABILITY 16 (The MIT Press, 2010).

⁹⁷ See *There’s No Choice: We Must Grow GM Crops Now*, GUARDIAN (Mar. 15, 2014), <http://www.theguardian.com/commentisfree/2014/mar/16/gm-crops-world-food-famine-starvation>.

⁹⁸ See Environmentally Stable Development in the Third World, Effects of Western Development, INFO. FOR ACTION, http://www.informaction.org/index.php?menu=menua.txt&main=susdeg_intro.txt (last visited Oct. 7, 2016). See generally Christina De Tore, *Endangered Humans: The Effects of Globalization and Westernization on Small Scale Societies and Indigenous Populations*, TANGENTS, <http://ux.brookdalecc.edu/fac/history/Tangents/Articles%20for%20Vol%20III/Microsoft%20Word%20-%20hon%20sem%20paper%20DeTore.pdf>.

⁹⁹ See generally ROSA & DIETZ, *supra* note 96, at 3.

¹⁰⁰ See Harte, *supra* note 78, at 933; MARKKU OKSANEN, *Biodiversity Considered Philosophically: An Introduction*, in PHILOSOPHY & BIODIVERSITY 1 (Markku Oskanen & Juhani Pietarinen, eds., Cambridge Univ. Press 2004) (“Biodiversity is a contraction of biological diversity.”).

¹⁰¹ OKSANEN, *supra* note 100.

¹⁰² *Id.*

organisms from all sources, including inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part.”¹⁰³ This definition includes a three-tiered hierarchy: diversity within species, between species, and of ecosystems.¹⁰⁴ Another source elaborates on this hierarchy as follows: diversity within species is the amount of genetic diversity existing within a single species, whether geographically distinct or similar.¹⁰⁵ Diversity between species measures the variety of species within a region.¹⁰⁶ Diversity between ecosystems measures the extent of diversity within an ecosystem, a measure that can be tricky due to the interrelated nature of all of Earth’s ecosystems.¹⁰⁷

An alternate hierarchy compartmentalizes biodiversity slightly differently: first, the amount of different ecosystems and their relative frequencies geographically,¹⁰⁸ second, the number of animal and plant species and their relative frequencies,¹⁰⁹ and lastly, the genetic variation within each species.¹¹⁰ However categorized, biodiversity is a key term in conservation, which encompasses the richness of life and the diverse patterns it forms.¹¹¹ Greater leadership is needed in the CBD to ensure that the world recognizes the value of protecting global biodiversity.

A. *The Value of Biodiversity*

Humans reap the benefits of Earth’s biodiversity every day.¹¹² For ease of explanation, these benefits can generally be classified as either economic or non-economic, although their existence and effects intermingle.¹¹³

¹⁰³ CBD, *supra* note 7, art. 2.

¹⁰⁴ *Id.*

¹⁰⁵ Roberts, *supra* note 12, at 305.

¹⁰⁶ *Id.*

¹⁰⁷ *Id.*

¹⁰⁸ *Id.*

¹⁰⁹ *Id.*

¹¹⁰ *Id.*

¹¹¹ *What is Biodiversity?*, Environment, EUR. COMMISSION (Apr. 4, 2015), http://ec.europa.eu/environment/nature/biodiversity/intro/index_en.htm.

¹¹² *See generally* Roberts, *supra* note 12, at 304 (1992).

¹¹³ *Id.* at 306.

1. *Economic Benefits of Biodiversity*

Biodiversity provides great economic benefits, most tangibly experienced through the agricultural and pharmaceutical industries: our food and medicine.¹¹⁴

a. *Agriculture*

Human agricultural systems currently depend upon the continuing availability of biodiversity in nature. Numerous species of wild plants and animals are undeveloped economic resources,¹¹⁵ which, if preserved and utilized, will stabilize our food sources for generations to come.¹¹⁶ For example, fifty percent of Earth's food sources and fiber-producing plants were derived originally from wild species.¹¹⁷ Over half of the United States' increased crop productivity in previous decades can be attributed to the use of genetic resources in crop breeding,¹¹⁸ where plant genetic resources serve as the raw materials used by crop breeders.¹¹⁹ Traditional agricultural practices utilize varieties of wild crop strains that each have diverse traits and resistance to different plant diseases.¹²⁰ The breeding process differs from modern agricultural practices in that a breeder physically imports pollen from one plant to another, yielding a seed that contains the genetic traits of the former.¹²¹ The traditional process of crossing plants and selecting a good variety can take up to ten years.¹²² Modern agricultural practices, which tend to rely heavily on monocultures, LMOs, and pesticides,¹²³ also utilize wild crop strains to combat

¹¹⁴ *Id.*

¹¹⁵ *Id.*

¹¹⁶ *See generally id.*

¹¹⁷ Harte, *supra* note 78, at 941.

¹¹⁸ Downes, *supra* note 25.

¹¹⁹ Rebecca L. Margulies, *Protecting Biodiversity: Recognizing International Intellectual Property Rights in Plant Genetic Resources*, 14 MICH. J. INT'L L. 322, 325 (1992–1993).

¹²⁰ *Id.* at 326.

¹²¹ Richard Molinar, *Traditional Plant Breeding vs. Genetic Engineering—a Primer*, WESTERN FARM PRESS (Oct. 26, 2012), <http://westernfarmpress.com/management/traditional-plant-breeding-vs-genetic-engineering-primer>.

¹²² *Id.*

¹²³ Kumi Naidoo, *The Food System We Choose Affects Biodiversity: Do We Want Monocultures?*, GUARDIAN (May 22, 2014) <http://www.theguardian.com/sustainable-business/food-system-monocultures-gm-un-diversity-day>. *See* Nancy M. Trautman et al., *Modern Agriculture: Its Effects on the Environment*, CORNELL U., <http://psep.cce.cornell.edu/facts-slides-self/facts/mod-ag-grw85.aspx> (last visited Oct. 7, 2016) (on the rise of pesticide use in U.S. agricultural practices).

the risks associated with genetic uniformity of crops,¹²⁴ albeit in a much more deliberate and controlled way.¹²⁵

Genetic uniformity of crops leads to risks, which historically have been remedied by utilizing Earth's biodiversity. If a farmer's sole crop is genetically identical corn (i.e. genetic uniformity), and a disease that is corn-specific manifests, the disease will spread rapidly.¹²⁶ To illustrate, fifty years ago,¹²⁷ the Panama disease infected the world's commercial bananas, all of which were genetically identical.¹²⁸ This fungal disease spread quickly from Central America and infected all of the world's commercial banana sources.¹²⁹ Luckily, the industry located a Chinese variety of banana that was resistant to the disease,¹³⁰ which quickly became the mainstream genetic variety of commercial bananas.¹³¹ Unsurprisingly, a new strain of the disease has recently been identified on two plantations in Mozambique, which yet again threatens another extinction of a banana species. As Dan Koeppel¹³² explained, "when you replace a varied multiculture with a monoculture, if a disease happens, you're in trouble: nature comes back and bites you."¹³³ In order to combat risks like the Panama disease, genetic breeders continuously incorporate genes from wild plants, which naturally evolve to resist new diseases.¹³⁴ The availability of

¹²⁴ Margulies, *supra* note 119, at 326.

¹²⁵ Michael K. Hansen, *Genetic Engineering Is Not An Extension of Conventional Plant Breeding; How genetic engineering differs from convention breeding, hybridization, wide crosses and horizontal gene transfer*, CONSUMER POL'Y INST. (Jan. 2000), <https://consumersunion.org/wp-content/uploads/2013/02/Wide-Crosses.pdf>.

¹²⁶ Henry S. Cole, *Nature Avoids Monocultures Like the Plague (We Should Too.)*, EKOS² (July 12, 2010), <https://ecosquared.wordpress.com/2010/07/12/nature-avoids-monocultures-like-the-plague-we-should-too/>; Glenn A. Helmers, Charles F. Yamoah, & Gary E. Varvel, *Notes and Unique Phenomenon, Separating the Impacts of Crop Diversification and Rotations on Risk*, AGRON J. (2001), <http://naldc.nal.usda.gov/download/16642/PDF> ("Rotation cropping of corn and soybean was found to have a significant risk advantage over monoculture production.").

¹²⁷ Jacopo Prisco, *Why Banana's As We Know Them Might Go Extinct (Again)*, CNN (Oct. 15, 2015), <http://www.cnn.com/2015/07/22/africa/banana-panama-disease/>.

¹²⁸ Cole, *supra* note 126; *What is Panama Disease?*, PANAMA DISEASE, <http://panamadisease.org/en/the-problem> (last visited Oct. 7, 2016).

¹²⁹ Prisco, *supra* note 127.

¹³⁰ Cole, *supra* note 126.

¹³¹ Prisco, *supra* note 127.

¹³² Dan Koeppel is the author of *Banana: The Fate of the Fruit That Changed the World. Bananas: The Uncertain Future of a Favorite Fruit*, NPR (Aug. 30, 2011, 10:51 AM), <http://www.npr.org/2011/08/30/139787380/bananas-the-uncertain-future-of-a-favorite-fruit>.

¹³³ Prisco, *supra* note 127.

¹³⁴ See Margulies, *supra* note 119, at 326.

diverse genes in nature is imperative for agriculture to flourish and subsequently feed the world.¹³⁵

b. Medicine

Biodiversity is also essential for the ongoing development of new medicines.¹³⁶ New medicinal insights and tools came not from human imagination but from observing other people and species.¹³⁷ This is especially true for those countries that still use traditional medicine. Traditional medicine includes the human use of herbs and minerals that contain parts of plants, other plant materials, or combinations as active ingredients.¹³⁸ The World Health Organization (WHO) estimated that traditional medicine is the primary healthcare source of over eighty percent of the population in Africa and the majority of the populations in both Asia and Latin America.¹³⁹ For modern pharmaceutical research, natural resources serve as potential leads for new chemical structures in medicine and can even yield ready-made drugs.¹⁴⁰ For example, scientists recently found a compound in the north Queensland rainforests in Australia that they are testing for its effects on non-metastasized tumors.¹⁴¹ In the 1980s, researchers successfully identified and derived an ovarian cancer chemotherapy drug later known as Taxol.¹⁴² Taxol is the chemical *paclitaxel*, which scientists discovered in the Pacific Yew tree that grows in the Pacific Northwest.¹⁴³ Many other drugs derived from plants are now commonplace in our medicine cabinets and local drug stores, like aspirin, throat lozenges,¹⁴⁴ and even Sudafed.¹⁴⁵ The availability of diverse genes in

¹³⁵ *Id.* at 325–26.

¹³⁶ Robert B. Young, *Importance of Biodiversity to the Modern Pharmaceutical Industry*, 71 PURE & APPLIED CHEMISTRY, 1655, 1657 (1999).

¹³⁷ NAT'L RESEARCH COUNCIL, PERSPECTIVES ON BIODIVERSITY: VALUING ITS ROLE IN AN EVERCHANGING WORLD 60–61 (1999), <http://www.ncbi.nlm.nih.gov/books/NBK224412/>.

¹³⁸ *Traditional Medicine: Definitions*, WORLD HEALTH ORG., <http://www.who.int/medicines/areas/traditional/definitions/en/> (last visited Oct. 7, 2016).

¹³⁹ A.A. Salim, et al., *Bioactive Molecules and Medicinal Plants*, in BIOACTIVE MOLECULES AND MEDICINAL PLANTS 1, 4 (Ramawat, Mérrilon & Jean-Michel eds., 2008).

¹⁴⁰ Young, *supra* note 136, at 1660. Compounds can also be used as drug precursors, templates for synthetic modification, and pharmacological probes. Salim et al., *supra* note 139, at 1.

¹⁴¹ *Cancer Drug Made From Rainforest Plant Shows Promise, Study Says*, FOX NEWS (Oct. 8, 2014), <http://www.foxnews.com/health/2014/10/08/cancer-drug-made-from-rainforest-plant-shows-promise-in-pre-clinical-study/>; *New Cancer Drug Promising, But Has a Long Way to Go*, SCI. IN THE NEWS BLOG (Oct. 13, 2014), <http://sitn.hms.harvard.edu/waves/2014/new-cancer-drug-promising-but-has-a-long-way-to-go/>.

¹⁴² John Copeland Nagle, *Biodiversity and Mom*, 30 ECOLOGY L.Q. 991, 998 (2003).

¹⁴³ *Id.*

¹⁴⁴ Plant Medicines, NOVA FORGOTTEN GENIUS, <http://www-tc.pbs.org/wgbh/nova/julian/media/lrk-disp-plantmedicines.pdf> (last visited Oct. 7, 2016).

nature is vital to the continued development and sustainability of humanity's medicinal systems.¹⁴⁶

c. Economic Impact

Our medicinal and food systems not only sustain life, but also provide vast economic stimulation internationally and domestically.¹⁴⁷ WHO estimated that the global pharmaceutical industry is worth \$300 billion a year, and asserted that six of the ten largest drug companies in the world are based in the United States¹⁴⁸—making the conservation of biodiversity particularly significant to the United States. Agriculture and agriculture-related industries contributed a considerable \$789 billion to the United States gross domestic product in 2013 alone.¹⁴⁹ Both of these industries, as explained above, rely heavily on the continued availability of global biodiversity in nature.¹⁵⁰ The United States should recognize that their involvement with an international effort to conserve biodiversity will protect two very lucrative industries: agriculture and pharmaceuticals.¹⁵¹ As eloquently stated by environmental law Professor David Takacs,¹⁵² “the variety of life on earth represents an extraordinary intellectual resource, and is essentially the basic library on which the life sciences can build . . . the kind of rapid loss that we are experiencing in the 20th century is a form of book-burning and one of the greater anti-intellectual acts of all time.”¹⁵³

¹⁴⁵ Therese Oneill, *8 Drugs that Exist in Nature*, THE WEEK (May 29, 2013), <http://theweek.com/articles/464010/8-drugs-that-exist-nature>.

¹⁴⁶ See Young, *supra* note 136, 1660. Compounds can also be used as drug precursors, templates for synthetic modification, and pharmacological probes. *Id.*

¹⁴⁷ See *Pharmaceutical Industry*, WORLD HEALTH ORG., <http://www.who.int/trade/glossary/story073/en/> (last visited Oct. 30, 2015) (original version on file with *Emory International Law Review* as of Oct. 26, 2016); See *Ag and Food Sectors and the Economy*, U.S. DEP'T OF AGRIC. ECON. RES. SERV., <http://ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/ag-and-food-sectors-and-the-economy.aspx> (last updated May 14, 2015). See also Harte, *supra* note 78, at 992.

¹⁴⁸ *Pharmaceutical Industry*, *supra* note 147.

¹⁴⁹ *Ag and Food Sectors and the Economy*, *supra* note 147.

¹⁵⁰ See Snape, *Joining the CBD*, *supra* note 35, at 7; see generally Young, *supra* note 136; Harte, *supra* note 78, at 941.

¹⁵¹ See Snape, *Joining the CBD*, *supra* note 35, at 12.

¹⁵² For a biography of Professor David Takacs, see *David Takacs*, ROBERT & PATRICIA SWITZER FOUND., <http://www.switzernetwork.org/users/david-takacs> (last visited Nov. 14, 2016).

¹⁵³ DAVID TAKACS, THE IDEA OF BIODIVERSITY: PHILOSOPHIES OF PARADISE (1996) (excerpt available at <http://www.dhushara.com/book/diversit/restor/takacs.htm>).

2. *Non-Economic Benefits of Biodiversity*

In addition to economic benefits, biodiversity offers great non-economic benefits, specifically in the form of aesthetic value¹⁵⁴ and culture or tradition.¹⁵⁵

When viewing diversity between species through a macro lens,¹⁵⁶ the aesthetic value of biodiversity is boundless. Aesthetic value of biodiversity is the pure human enjoyment of nature's existence,¹⁵⁷ the view that nature is a "realm of spiritual and aesthetic inspiration to be enshrined and honored."¹⁵⁸ Wild animals, plants, habitats and ecosystems serve as a source of wonder, inspiration, and joy to humans around the world.¹⁵⁹ This is evidenced by a willingness of people to pay more money in order to live amongst wildlife and natural resources, like in many areas of the Pacific Northwest.¹⁶⁰ Aesthetic value is further illustrated by human interest in many recreational activities like bird watching, bee keeping, participation in native-plant societies, and nature photography.¹⁶¹ Recreational activities have particular value in the U.S. legal system, with many environmental statutes carving out a specific right for citizens to bring suit when their aesthetic interests are harmed.¹⁶² In *Lujan v. National Wildlife Federation*, the Supreme Court stated, "[w]e have no doubt that 'recreational use and aesthetic enjoyment' are among the sorts of interests those statutes were specifically designed to protect."¹⁶³ If U.S. law protects citizens' right to experience aesthetic value in nature domestically, the United States should also endorse legal protection internationally.

Beyond Western economics and aesthetics, various cultures also value biodiversity on a cultural level. These cultures, like the Ojibway people in Ontario, believe that the land is owned by no one, and posit that all plants are a

¹⁵⁴ Roberts, *supra* note 12, at 307.

¹⁵⁵ See Darrell Addison Posey, *Introduction: Culture and Nature—the Inextricable Link*, in CULTURAL AND SPIRITUAL VALUES OF BIODIVERSITY, U.N. ENVIRONMENT PROGRAMME 3, 11 (1999), http://www.unep.org/pdf/Cultural_Spiritual_thebible.pdf.

¹⁵⁶ Roberts, *supra* note 12, at 304.

¹⁵⁷ Scott C. Lucas, *Halting the Downward Spiral of Monoculturization and Genetic Vulnerability: Toward a Sustainable and Biodiverse Food Supply*, 17 J. ENVTL. L. & LITIG. 161, 180 (2002).

¹⁵⁸ Catherine J. Tinker, *Introduction to Biological Diversity: Law, Institutions, and Science*, 1 BUFF. J. INT'L L. 1, 6 (1994).

¹⁵⁹ Roberts, *supra* note 12, at 307.

¹⁶⁰ Lucas, *supra* note 157, at 180.

¹⁶¹ NAT'L RESEARCH COUNCIL, *supra* note 137, at 60.

¹⁶² See *Lujan v. National Wildlife Federation*, 497 U.S. 871, 886 (1990).

¹⁶³ *Id.*

spiritual gift upon them and should be valued as such.¹⁶⁴ “Such people and cultures view themselves and other environmental components with which they interact as belonging to the same continuous holistic system.”¹⁶⁵ Preservation of biodiversity means the preservation of these cultures; if species disappear, then the words, practices, and beliefs related to them will also disappear.¹⁶⁶ In turn, a loss of biodiversity changes cultural values, and the change of cultural values will affect future conceptions and practices a society endorses, creating a cyclical effect.¹⁶⁷

B. The Threat to and Current Trends of Biodiversity

The CBD identifies five pressures that threaten Earth’s valuable biodiversity: (1) habitat loss and degradation, (2) climate change, (3) nutrient overload and other pollution, (4) over-exploitation and unsustainable use, and (5) invasive alien species.¹⁶⁸

The largest pressure on biodiversity is habitat loss and degradation, which stems heavily from converting wild lands to agricultural lands and developments (either for housing or industrial uses).¹⁶⁹ The issue is that many wild lands are worth more to indigenous people dead than alive; whether from logging practices or cutting down trees for more farms.¹⁷⁰ Deforestation is defined as “[t]he conversion of forest to other land use or the long-term reduction of the tree canopy cover below the minimum 10 percent.”¹⁷¹ Since just 2000, six million hectares of forest have been lost world-wide each year.¹⁷²

¹⁶⁴ Andrew Gray, *Indigenous Peoples, Their Environments and Territories*, in CULTURAL AND SPIRITUAL VALUES OF BIODIVERSITY, U.N. ENV’T PROGRAMME 61, 77 (1999), http://www.unep.org/pdf/Cultural_Spiritual_thebible.pdf.

¹⁶⁵ Jules Pretty et al., *How Do Culture and Biodiversity Intersect* 9 (Apr. 2009) (Plenary paper for Conference “Sustaining Cultural and Biological Diversity In a Rapidly Changing World: Lessons for Global Policy”), <http://www.greenexercise.org/pdf/How%20do%20biodiversity%20and%20culture%20intersect.pdf>.

¹⁶⁶ *Id.* at 8–9.

¹⁶⁷ *Id.*

¹⁶⁸ CONVENTION ON BIOLOGICAL DIVERSITY, GLOBAL BIODIVERSITY OUTLOOK 3, 7 (2010), <https://www.cbd.int/doc/publications/gbo/gbo3-final-en.pdf> [hereinafter OUTLOOK 3]; *The Loss of Biodiversity From Human Activity*, NAT’L AERONAUTICS & SPACE ADMIN., http://ete.cet.edu/gcc/?/bio_loss_of_diversity_humact/ (last visited Oct. 7, 2016).

¹⁶⁹ OUTLOOK 3, *supra* note 168, at 55.

¹⁷⁰ Roddy Scheer & Doug Moss, *Deforestation and Its Extreme Effect on Global Warming*, SCI. AM. (Nov. 13, 2012), <http://www.scientificamerican.com/article/deforestation-and-global-warming/>.

¹⁷¹ Cesar Sabogal, *Identifying Drivers of Land Use Change In South America*, FOREST RES. MGMT. TEAM (2014), <https://www.cbd.int/doc/meetings/ecr/cbwe-cr-sa-01/other/cbwe-cr-sa-01-fao-01-en.pdf>.

¹⁷² *Why is biodiversity in crisis?*, INT’L UNION FOR CONSERVATION OF NATURE & NAT. RESOURCES (Sept. 3, 2010), <http://www.iucnredlist.org/news/biodiversity-crisis>.

South America is disproportionately affected by deforestation;¹⁷³ globally, 0.13% of forests are cut down each year whereas in South America the percentage is as much as 0.45% per year.¹⁷⁴ Forests are not only important in conserving biodiversity,¹⁷⁵ but they are also important in protecting against global warming, often called “The Earth’s Lungs.”¹⁷⁶ Deforestation increases CO₂ levels in the air because living trees store CO₂, and when they are cut down, they release the stored CO₂ back into the air.¹⁷⁷ Deforestation obstructs natural carbon cycles and increases the risk of climate change and global warming.¹⁷⁸

The second pressure on biodiversity is climate change. Climate change is “any change in climate over time, whether due to natural variability or as a result of human activity.”¹⁷⁹ The climate is changing at rapid rates. According to the Intergovernmental Panel on Climate Change, the average global temperature increased by about 0.76°C and the global mean sea level rose by twelve to twenty-two centimeters during the last century.¹⁸⁰ Climate change harms biodiversity by changing the weather conditions of natural ecosystems, thereby affecting and degrading those conditions that species thrive in.¹⁸¹

The third pressure on biodiversity is nutrient overload and other pollution in the Earth’s bodies of water. “While some levels of nitrogen and phosphorus are found naturally in water, human activity elevates these levels to a degree that causes hypoxic conditions, eutrophication, and dead zones.”¹⁸² Dead zones

¹⁷³ See Sabogal, *supra* note 171.

¹⁷⁴ *Id.*

¹⁷⁵ Scheer & Moss, *supra* note 170. “Exacerbating global warming isn’t the only negative impact of tropical deforestation. It also wipes out biodiversity: More than half of the world’s plant and animal species live in tropical rainforests.” *Id.*

¹⁷⁶ Alina Bradford, *Deforestation: Facts, Causes & Effects*, LIVE SCIENCE (Mar. 4, 2015), <http://www.livescience.com/27692-deforestation.html>. See *United States and the Convention on Biological Diversity*, DEFENDERS OF WILDLIFE & CTR. FOR BIOLOGICAL DIVERSITY, http://www.defenders.org/publications/the_u.s._and_the_convention_on_biological_diversity.pdf.

¹⁷⁷ Bradford, *supra* note 176.

¹⁷⁸ *Id.*

¹⁷⁹ *Fact sheet: Climate Change Science - the Status of Climate Change Science Today*, U.N. FRAMEWORK CONVENTION ON CLIMATE CHANGE 1 (Feb. 2011), http://unfccc.int/files/press/backgrounders/application/pdf/press_factsh_science.pdf, [hereinafter *Fact sheet: Climate change science*].

¹⁸⁰ Introduction, *Climate Change*, CONVENTION ON BIOLOGICAL DIVERSITY, <https://www.cbd.int/climate/intro.shtml>.

¹⁸¹ *Fact sheet: Climate change science*, *supra* note 179, at 2–3.

¹⁸² Mary Beth Blausler, *Solving the Puzzle of Nutrient Overload Piece by Piece*, 1 CHI.-KENT J. ENV’T & ENERGY L. 48, 62 (2011).

are aquatic areas that sustain no life—low levels of oxygen either drive species out or suffocate immobile species.¹⁸³

The fourth pressure on biodiversity is over-exploitation and unsustainable use of resources—most notably over-fishing and over-hunting of undomesticated animals.¹⁸⁴ The U.N. Food and Agriculture Organization estimates that more than half of marine fish stocks are fully exploited.¹⁸⁵ The parties to the CBD also recognized the unsustainable hunting of undomesticated animals, commonly referred to as “*bushmeat*,” as a large threat to global biodiversity.¹⁸⁶

The fifth identified pressure is the invasion of alien species into ecosystems. Invasive species can endanger ecosystems and their biodiversity by changing an entire habitat and crowding out other more beneficial species that typically thrive in that habitat.¹⁸⁷ For example, a Russian mussel accidentally brought to the United States threatens extinction of at least thirty domestic freshwater mussel species.¹⁸⁸ Farmers also lose their pastures and croplands to invasive plant species, which can lead to famine in regions that depend primarily on local agriculture.¹⁸⁹

The CBD, either directly or indirectly, seeks to reduce human activities that exacerbate these often already existing pressures.¹⁹⁰ Although ecosystems naturally change and species go extinct over extended periods of time, current documented rates of extinction are estimated to be approximately one hundred times higher than typical rates in the fossil record.¹⁹¹ Given this and accompanying data, scientists have also determined that it would be feasible

¹⁸³ *Id.* at 58.

¹⁸⁴ OUTLOOK 3, *supra* note 168, at 62. See *Bushmeat*, U.S. FISH & WILDLIFE SERV.: INT’L AFF., <http://www.fws.gov/international/wildlife-without-borders/global-program/bushmeat.html>.

¹⁸⁵ OUTLOOK 3, *supra* note 168, at 48.

¹⁸⁶ NATHALIE VAN VLIET, CBD BUSHMEAT LIASON GRP., LIVELIHOOD ALTERNATIVES FOR THE UNSUSTAINABLE USE OF BUSHMEAT 5 (2011).

¹⁸⁷ Daniel Simberloff, *Introduced Species: The Threat to Biodiversity & What Can Be Done*, ACTIONBIOSCIENCE (Dec. 2000), <http://www.actionbioscience.org/biodiversity/simberloff.html>.

¹⁸⁸ *Id.*

¹⁸⁹ Mary Jane Angelo, et al., *Reclaiming Global Environmental Leadership: Why the United States Should Ratify Ten Pending Environmental Treaties*, 1201 CTR. PROGRESSIVE REFORM 19 (Jan. 2012), http://www.progressivereform.org/articles/International_Environmental_Treaties_1201.pdf.

¹⁹⁰ OUTLOOK 3, *supra* note 168, at 15.

¹⁹¹ Neville Ash et al., *Biodiversity*, in U.N. ENV’T PROGRAMME, GLOBAL ENVIRONMENT OUTLOOK 4 (GEO 4) 164 (Oct. 2007).

for these rates to soar from one thousand to ten thousand times higher than background extinction rates in the near decades.¹⁹²

III. A GROWING NEED FOR LEADERSHIP

Despite the contracting parties' efforts or intentions, the CBD has unfortunately not been a great success at conserving global biodiversity.¹⁹³ The ten-year anniversary of the CBD's implementation showed that the contracting parties' goal of reducing biodiversity loss at the global, regional, and national levels has not been met.¹⁹⁴ Rates of extinction have, on average, either increased or remained constant—a figure which policy makers attribute to the steady growth of the five pressures on biodiversity.¹⁹⁵ Today, over twenty years since the CBD's implementation, these trends remain the same.¹⁹⁶ The conservation of biodiversity needs leadership, specifically from the United States.¹⁹⁷

A. *Why the United States?*

The United States should ratify the CBD because (1) the United States would likely not have to change any domestic laws in implementation,¹⁹⁸ (2) the United States contributes massively to the growing pressures on biodiversity, and (3) U.S. involvement would greatly improve the CBD's chances of success.

The United States would not need to change existing laws to implement and comply with the CBD domestically.¹⁹⁹ This makes implementation and compliance not only easy, but also consistent with current U.S. values already codified in law.²⁰⁰ In early negotiations with Congress, President Bill Clinton stated, "existing programs and authorities are considered sufficient to enable

¹⁹² *Id.*

¹⁹³ Ritter, *supra* note 8. See also William J. Snape, *Why Everyone Loses From US Boycott of the UN Biodiversity Agreement*, CHINA DIALOGUE, (Apr. 10, 2012) [hereinafter Snape, *Why Everyone Loses*].

¹⁹⁴ Ritter, *supra* note 8.

¹⁹⁵ Juliette Jowit, *International Failure to Meet Target to Reduce Biodiversity Decline*, GUARDIAN (Apr. 29, 2010), <http://www.theguardian.com/environment/2010/apr/29/international-failure-biodiversity-decline>.

¹⁹⁶ Snape, *Why Everyone Loses*, *supra* note 193.

¹⁹⁷ *Id.*

¹⁹⁸ Snape, *Joining the CBD*, *supra* note 35, at 6.

¹⁹⁹ *Id.*

²⁰⁰ *Id.* at 14.

any activities necessary to effectively implement our responsibilities under the Convention.”²⁰¹

Ethically speaking, the United States should participate in the global conservation of biodiversity because the United States is in part responsible for the growing pressures on biodiversity—most notably in agriculture. Agriculture in the United States changed rapidly in the 20th century: from small, diversified farms to large, specialized farms.²⁰² Modern agricultural practices, while much more efficient,²⁰³ have wreaked havoc on U.S. lands—causing nutrient overload in bodies of water, “super-bugs” from pesticide overuse, and massive soil erosion.²⁰⁴ New agricultural methods have stimulated the U.S. economy and GDP,²⁰⁵ yet the United States still imports over 9,000 metric tons of vegetables, over 12,000 metric tons of fruits, and over 11,000 metric tons of grains and grain products per year from over sixty-nine nations.²⁰⁶ Arguably following the United States’ lead, many Latin American states have realized the profitability of big agriculture—especially in land rich areas like Argentina, Brazil, Paraguay, and Uruguay.²⁰⁷ Latin American states have begun rapidly producing sugar, soy, and meat.²⁰⁸ One way to rapidly

²⁰¹ *Id.*

²⁰² CAROLYN DIMITRI ET AL., U.S. DEP’T OF AGR., *THE 20TH CENTURY TRANSFORMATION OF U.S. AGRICULTURE AND FARM POLICY 2* (June 2005).

²⁰³ *Id.* (“U.S. agriculture has become increasingly efficient and has contributed to the overall growth of the U.S. economy. Output from U.S. farms has grown dramatically, allowing consumers to spend an increasingly smaller portion of their income on food and freeing a large share of the population to enter nonfarm occupations that have supported economic growth and development. As a part of the transformation spurred by technological innovation and changing market conditions, production agriculture has become a smaller player in the national and rural economies.”). These dramatic changes were produced by technological innovations, development of hybrid strains and other genetic improvements, and a fourfold increase in the use of pesticides and fertilizer. Nancy M. Trautmann, et al., *Modern Agriculture: Its Effects on the Environment*, CORNELL U. COOPERATIVE EXTENSION, <http://psep.cce.cornell.edu/facts-slides-self/facts/mod-ag-grw85.aspx> (last visited Oct. 7, 2016).

²⁰⁴ Trautmann, et al., *supra* note 203.

²⁰⁵ *Id.*

²⁰⁶ *U.S. Food Imports*, U.S. DEP’T OF AGRIC., <http://ers.usda.gov/data-products/us-food-imports.aspx#25418> (last visited Oct. 7, 2016).

²⁰⁷ Klaus Deininger & Derek Byerlee, *The Rise of Large-Scale Farms in Land-Abundant Developing Countries: Does it Have a Future?*, 4 (World Bank Dev. Research Grp., Working Paper No. 5588, 2011), http://www-wds.worldbank.org/external/default/WDSContentServer/WDS/IB/2011/03/14/000158349_20110314094014/Rendered/PDF/WPS5588.pdf; *Argentina: The country that Monsanto poisoned?*, OVER GROW THE SYSTEM (Dec. 29, 2014), <http://www.overgrowthesystem.com/argentina-the-country-that-monsanto-poisoned-photo-essay/>.

²⁰⁸ Deininger, *supra* note 207, at 4.

produce meat is clearing forestland to make room for large livestock ranching.²⁰⁹

The United States should realize the interconnectedness between its own agricultural developments and the spread to rest of the world—the rise of big agriculture turned small farms into global exporters.²¹⁰ Large U.S. agribusiness companies have also expanded into various foreign countries. For example, Monsanto is a U.S. Fortune 500 corporation with its headquarters in Missouri.²¹¹ It is also now present in sixty-six different countries, selling LMO seeds to farmers worldwide.²¹² Surely the United States recognizes the need to protect lucrative industries, but U.S. lawmakers need to strike a balance between conserving biodiversity and protecting lucrative businesses. Switzerland, a party state to the CBD, is home to Monsanto's biggest competitor, Syngenta.²¹³ If Switzerland and its companies can operate within the bounds of the CBD, why not the United States? Ethically, the United States should step in and recognize its critical involvement with pressures on biodiversity.

If the United States were to take a leadership position in conserving biodiversity, the CBD would have a much greater likelihood of success. Environmental lawmaking is unique in that any resolution of environmental problems requires that at least those countries primarily or potentially contributing to the problem participate in the regime.²¹⁴ This piggybacks on the United States' ethical duty to join the CBD and emphasizes the inefficacy of treaties that do not apply to all contributors to the problem.²¹⁵ Perhaps this contention is far-fetched—but consider how U.S. involvement influenced two different climate change treaties: (1) The Montreal Protocol and (2) The Kyoto Protocol. With the support of President Ronald Reagan, The Montreal Protocol

²⁰⁹ *Id.*

²¹⁰ *Id.*

²¹¹ *Monsanto Facilities Around the World*, MONSANTO, <http://www.monsanto.com/whoweare/pages/our-locations.aspx> (last visited Nov. 15, 2016).

²¹² *See generally id.*

²¹³ Christina Sarich, *The 10 Companies Controlling the World's Seed Supply*, NATION OF CHANGE (Oct. 21, 2013), <http://www.nationofchange.org/10-companies-controlling-world-s-seed-supply-1382363748>.

²¹⁴ MARK WESTON JANIS & JOHN E. NOYES, *INTERNATIONAL LAW CASES AND COMMENTARY* 691 (West Academic Pub, 5th ed. 2014).

²¹⁵ *See id.*

became known as the most successful environmental treaty ever,²¹⁶ with compliance rates at over ninety-eight percent.²¹⁷

The Montreal Protocol regulates states' usage of chlorofluorocarbons.²¹⁸ Chlorofluorocarbons (CFCs) are chemicals found in everyday products, like hairspray, which deplete the ozone layer.²¹⁹ Unlike the Montreal Protocol, the Kyoto Protocol has been unsuccessful.²²⁰ The Kyoto Protocol addresses climate change at a wider angle, targeting not just specific harmful substances, but rather climate change as a whole.²²¹ The United States never ratified the Kyoto Protocol and compliance rates have been abysmal.²²² The Montreal Protocol and Kyoto Protocol are very different—where Montreal incentivizes unilateral compliance, Kyoto makes it a burden to comply when other states do not.²²³ Montreal also focuses specifically on CFC use, where Kyoto attempts to combat the much wider defined problem of climate change.²²⁴ Why the United States took a leadership position in Montreal but not in Kyoto is unclear. One theory posits that President Reagan simply loved the environment and believed in the banning of CFCs.²²⁵ Another theory considers that in the Kyoto Protocol, the costs of compliance outweighed the value that the United States would receive by joining.²²⁶ Whatever the reasons may have been, it is clear that while Montreal was a success, Kyoto has been a failure.²²⁷ An obvious, yet tenuous, reason for the success of the Montreal Protocol is that the United States participated; the United States encouraged compliance and helped create a treaty that actually worked.

²¹⁶ Sean Cumberlege, *Multilateral Environmental Agreements: From Montreal to Kyoto—A Theoretical Approach to an Improved Climate Change Regime*, 37 *DENV. J. INT'L L. & POL'Y* 303, 304 (2008–2009); Justin Gillis, *The Montreal Protocol, a Little Treaty That Could*, *N.Y. TIMES* (Dec. 9, 2013), http://www.nytimes.com/2013/12/10/science/the-montreal-protocol-a-little-treaty-that-could.html?_r=1.

²¹⁷ *Key Achievements of the Montreal Protocol to Date*, U.N. ENV'T PROGRAMME, http://ozone.unep.org/Publications/MP_Key_Achievements-E.pdf.

²¹⁸ Gillis, *supra* note 216; *Paris via Montreal: The Quickest Way to Cut Greenhouse Gases is to Expand the Montreal Protocol*, *ECONOMIST* (Sept. 18, 2014, 4:01 PM), <http://www.economist.com/news/leaders/21618781-quickest-way-cut-greenhouse-gases-expand-montreal-protocol-paris-montreal>.

²¹⁹ Gillis, *supra* note 216.

²²⁰ Cumberlege, *supra* note 216, at 304.

²²¹ *Id.*

²²² *Id.*

²²³ *Id.*

²²⁴ *Id.*

²²⁵ Gillis, *supra* note 216.

²²⁶ Cass R. Sunstein, *Montreal versus Kyoto: A Tale of Two Protocols*, 31 *HARV. ENVTL. L. REV.* 1 (2007).

²²⁷ Cumberlege, *supra* note 216, at 304.

B. *Suggestions Moving Forward*

The United States should (1) ratify the CBD with understandings and (2) make necessary amendments that will allow the treaty to function in a way that its drafters envisioned.

1. *Ratification*

The United States first needs to ratify the CBD. As per Article 34 of the CBD, the treaty is freely open for ratification by any signatory as of June 4, 1993.²²⁸ As the United States is already a signatory,²²⁹ it would only need to deposit a notice of accession with the Depository to become a contracting party to the treaty.²³⁰ Ratification will trigger two significant effects: (1) the United States will become bound by all provisions of the CBD and, more importantly, (2) the United States will become eligible to propose new protocols and amend the original text of the CBD.²³¹ Ratification is key in allowing the United States to fully assume a leadership role within the CBD.

Although reservations are explicitly disallowed,²³² the United States may elect to ratify with understandings of certain provisions of the CBD. For example, considering the U.S. lawmakers' preoccupation with the treaty's effect on biotech industry and the patent regime,²³³ the United States may wish to draft an understanding that further clarifies the effect of Article 16. Article 16 deals with technology transfer between states and provides that "such access and transfer shall be provided on terms which recognize and are consistent with the adequate and effective protection of intellectual property rights."²³⁴ The United States could add more precise language and an illustration, for example: *The United States understands that this treaty will not affect any preexisting or future patent rights held by owners of U.S. patents nor affect obligations of international licensees.*

²²⁸ CBD, *supra* note 7, art. 34.

²²⁹ Blomquist, *supra* note 20.

²³⁰ CBD, *supra* note 7, art. 34.

²³¹ *Id.* art. 29 ("Amendments to this protocol may be proposed by any contracting party.").

²³² *Id.* art. 37.

²³³ Daniel T. Jenks, *A Convention on Biological Diversity—An Efficient Framework for the Preservation of Life on Earth?*, 15 NW. J. INT'L L. & BUS. 636, 637 (1995).

²³⁴ CBD, *supra* note 7, art. 16.

2. Amendments

After ratification, the United States will be a contracting party state entitled to suggest amendments to the treaty and new protocols.²³⁵ The reason the CBD has failed to conserve and restore biodiversity effectively is that party states are not doing enough.²³⁶ A 2010 press release from the CBD noted that a *new vision is necessary* to stave off dramatic biodiversity loss.²³⁷

Although the drafters of the CBD did not envision a direct enforcement mechanism,²³⁸ surely they envisioned a treaty that functioned to conserve global biodiversity. Compliance is arguably the CBD's greatest weakness.²³⁹ Simply put, states need to expend greater efforts to conserve biodiversity.²⁴⁰ In order to effect greater compliance, the United States should amend the CBD to include a stronger compliance mechanism, as current methods have proven ineffective.²⁴¹

The compliance mechanism used in the Montreal Protocol could serve as a model for the CBD. The Montreal Protocol is one of the rare environmental treaties that has an enforcement mechanism and, as noted earlier, has a compliance rate of over ninety-eight percent.²⁴² If a party state to the Montreal Protocol does not comply, it may face steep penalties like trade sanctions.²⁴³ The mechanism, however, is not a one size fits all approach; the Implementation Committee has developed a system for the equitable treatment of all Parties.²⁴⁴ This involves working with an individual Party to establish a reasonable plan for bringing the Party back into compliance and then seeking appropriate support to enable the plan to be carried out.²⁴⁵ For example, when

²³⁵ *Id.* art. 29.

²³⁶ Press Release, Convention on Biological Diversity, *New Vision Required to Stave Off Dramatic Biodiversity Loss*, Says UN Report (May 10, 2010), <https://www.cbd.int/doc/press/2010/pr-2010-05-10-gbo3-en.pdf>.

²³⁷ *Id.*

²³⁸ Sikina S. Hasham, *The World Bank Appraises the Value of Biodiversity*, HUM. RTS. BRIEF (Feb. 12, 2011), <http://hrbrief.org/2011/02/the-world-bank-appraises-the-value-of-biodiversity/>.

²³⁹ *See id.*

²⁴⁰ Jowitz, *supra* note 195.

²⁴¹ Hasham, *supra* note 238.

²⁴² Atmospheric Pressure: *Why Some Environmental Agreements Work and Others Don't*, ECONOMIST (Apr. 17, 2003), <http://www.economist.com/node/1715055>.

²⁴³ *Id.*

²⁴⁴ MONTREAL PROTOCOL ON SUBSTANCES THAT DEplete THE Ozone Layer 2007: A SUCCESS IN THE MAKING, U.N. ENV'T PROGRAMME, http://ozone.unep.org/Publications/MP_A_Success_in_the_making-E.pdf (last visited Nov. 14, 2016).

²⁴⁵ *Id.*

the Russian Federation was not in compliance, the Russian government notified the Conference of the Parties that it was experiencing difficulties in implementation.²⁴⁶ The Implementation Committee then adopted punitive measures prohibiting the trade of ozone-depleting substances with states that were not parties of the Commonwealth of Independent States.²⁴⁷

The United States should suggest a similar mechanism for the CBD by perhaps incorporating the already existing technology transfer and benefit sharing in the treaty; if a state is not in compliance, then the state should see reductions in technology transfer or benefit sharing from other party states. Of course, like in Montreal, the determinations should be flexible and particular to each state's conditions. Inserting penalties for non-compliance into the CBD could generate higher compliance rates. Higher compliance rates, at the very least, could shed light on the substantive efficacy of the treaty; if compliance is up yet biodiversity rates are still plummeting, then there is clearly a need for more changes and considerations.

The United States should also endorse new protocols that focus on the first goal of the CBD: the conservation of biological diversity.²⁴⁸ The Cartagena Protocol deals with the environmental impacts of LMOs crossing international borders and the Nagoya Protocol focuses on the equitable sharing of genetic resource benefits, both of which further goals of the treaty. However, both are only tangentially related to actual conservation of biodiversity. More specific protocols should be enacted that hone in on concrete pressures threatening biodiversity. As exemplified by the Montreal Protocol and Kyoto Protocol, specificity can lead to better results. Montreal's specific plight against CFCs allowed countries to target the issue systematically, whereas Kyoto's broad goal of targeting climate change was too general and ultimately ineffective.²⁴⁹ The United States should specifically target the five pressures on biodiversity and develop protocols that systematically address how states should reduce these pressures.

²⁴⁶ Francesca Romanin Jacur, *The Non-Compliance Procedure of the 1987 Montreal Protocol to the 1985 Vienna Convention on Substances that Deplete the Ozone Layer, Triggering Non-Compliance Procedures*, in *NON-COMPLIANCE PROCEDURES AND MECHANISMS AND THE EFFECTIVENESS OF INTERNATIONAL ENVIRONMENTAL AGREEMENTS* (T. Treves et al., eds., 2009), http://www.academia.edu/3778606/The_Non-Compliance_Procedure_of_the_1987_Montreal_Protocol_to_the_1985_Vienna_Convention_on_Substances_that_Deplete_the_Ozone_Layer.

²⁴⁷ *Id.*

²⁴⁸ CBD, *supra* note 7, art. 1.

²⁴⁹ Cumberlege, *supra* note 216, at 304.

The issue would be determining what level of specificity is necessary for these protocols to function. For example, an identified pressure on biodiversity is climate change,²⁵⁰ which, as the Kyoto Protocol demonstrated, is perhaps too broad of a problem to tackle and enforce. Instead, a protocol to the CBD could address climate change in a very narrowly focused manner: by targeting methane emissions from livestock. This protocol could combat climate change by forcing reductions of domestic livestock, which globally are the primary source of methane gas in the atmosphere. Although most associate carbon dioxide with climate change, methane also plays an important and detrimental role.²⁵¹ One particularly unique feature of methane gas is its ability to be repurposed towards use in natural gas; methane, after all, is the main ingredient in natural gas.²⁵² Farmers have begun channeling methane from cow manure to power their farms; for example, a farm in “Vermont produces 5,000 kilowatt hours per day from the 30,000 gallons of daily manure their dairy cows produce.”²⁵³ Scientists around the world have also been attempting to genetically engineer cows that are “less-burpy” to deal with their overproduction of methane.²⁵⁴ In the future, this type of developing technology would be an ideal transfer to party states under existing CBD technology transfer provisions. Until then, a remedy may be to simply lower the global production of livestock products through a livestock protocol. Under a livestock protocol, states would be responsible for reducing the amount of their livestock farm production by a certain percentage—set proportionally to how much they produce annually. The CBD would benefit from a very specific and forward-thinking protocol that addresses a major pressure on biodiversity.

Imagine an additional protocol on the identified pressure of habitat loss and degradation that specifically targets deforestation. Like the Montreal Protocol’s caps on CFC production, this protocol could provide caps on acreage loss percentages per year.²⁵⁵ This protocol could also allow for a cap and trade program. Under this program, a country better equipped to deal with deforestation could save more acreage to help another state meet their quota in

²⁵⁰ *Outlook 3*, *supra* note 168.

²⁵¹ Richard Harris, *Methane Causes Vicious Cycle in Global Warming*, NPR (Jan. 26, 2010), <http://www.npr.org/templates/story/story.php?storyId=122638800>.

²⁵² *Id.*

²⁵³ Kathy Voth, *Cow Farts and Burps—Reduce, Reuse, Recycle*, ON PASTURE (Oct. 28, 2013), <http://onpasture.com/2013/10/28/cow-farts-and-burps-reduce-reuse-recycle/>.

²⁵⁴ *Id.*

²⁵⁵ *Market Mechanisms: Understanding the Options*, CTR. FOR CLIMATE AND ENERGY SOLUTIONS (Apr. 2015), <http://www.c2es.org/publications/market-mechanisms-understanding-options>.

exchange for something valuable.²⁵⁶ The key is to incentivize reforestation by making reforestation an economically viable possibility. As previously discussed, “the marketplace has yet to assign a value to the forest: it’s far more profitable to cut it down for grazing and farming than to leave it standing.”²⁵⁷ A protocol on deforestation could assign this necessary value to the forest. A theoretical quid-pro-quo could be the following: the United States would provide valuable sustainable farming techniques (so that farm land may be more easily reused, rather than lie in waste) in exchange for the continuing existence of the Brazilian rainforests to provide oxygen, regulate global weather patterns,²⁵⁸ and conserve grounds for profitable scientific research. As Pulitzer Prize-winning biologist E.O. Wilson stated, “useful products cannot be harvested from extinct species.”²⁵⁹ By providing mandatory limits on deforestation, valuable incentives, and a cap and trade system to ease the initial transition costs, the CBD could systematically attack the deforestation problem engulfing the globe.

In addition to protocols on livestock and deforestation, additional protocols could also be created to address any, or all, of the remaining pressures on biodiversity. Above all, it is necessary for U.S. policymakers to demonstrate that the conservation of biodiversity on a global scale actually secures U.S. interests in the international agricultural, research, and biotech sectors.²⁶⁰ Cost-benefit analyses color national decisions; where complying with the Montreal Protocol proved cost-effective, complying with the Kyoto Protocol did not seem to provide the same economic advantage or equilibrium to the United States. A tangible demonstration of the relatively low costs of implementation, and the large benefits reaped yearly from international biodiversity, would provide foundational logic for the United States to ratify the CBD.

CONCLUSION

The CBD desperately needs new leadership and vision to begin to combat the global loss of biodiversity. Despite the United States’ early involvement

²⁵⁶ *Id.*

²⁵⁷ Scott Wallace, *Farming the Amazon*, NAT’L GEOGRAPHIC <http://environment.nationalgeographic.com/environment/habitats/last-of-amazon/#page=3> (last visited Oct. 7, 2016).

²⁵⁸ Mike Bettwy, *Tropical Deforestation Affects Rainfall in the U.S. and Around the Globe*, NAT’L AERONAUTICS & SPACE ADMIN. (Sept. 13, 2005), http://www.nasa.gov/centers/goddard/news/topstory/2005/deforest_rainfall.html.

²⁵⁹ EDWARD O. WILSON, *THE DIVERSITY OF LIFE* 282 (Belknap Press 1992).

²⁶⁰ Ford, *supra* note 6.

with the CBD, fear of harming lucrative private industries precluded the United States from ratifying. Now, over two decades since the CBD's inception, global rates of biodiversity loss continue to skyrocket; the time to act is now. The United States should join the rest of the international community and take a leadership position in biodiversity conservation. First, the United States should ratify the CBD with understandings. Second, the United States should implement a stricter enforcement mechanism, which mirrors that of the Montreal Protocol. Finally, the United States should enact narrowly focused protocols that address specific identified pressures on biodiversity.

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