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Wings Without Borders: The Case for a Migratory Insect Treaty to Aid Monarch Butterflies

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WINGS WITHOUT BORDERS: THE CASE FOR A MIGRATORY INSECT TREATY TO AID MONARCH BUTTERFLIES

*Meena Miriam Yust**

For hundreds of years, migratory birds have been protected through treaties, yet that same protection has not been afforded to migratory butterflies. Monarch butterflies in particular are known for migrating over 3,000 miles through multiple generations from Mexico to the U.S. and Canada. Their population has been declining significantly over the last several decades. Butterflies, like other insects, are often overlooked; yet insects provide the U.S. \$57 billion worth of ecological services.¹ This Note argues that the U.S., Mexico, and Canada should enact a Migratory Insect Treaty to aid monarch butterflies and other migratory insects in order to protect their populations. In addition, this Note provides a draft treaty with commentary as a starting point for consideration of such an instrument.

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1. John E. Losey & Mace Vaughan, *The Economic Value of Ecological Services Provided by Insects*, 56 BIOSCIENCE 311, 311 (2006); see also Ezequiel Lugo, *Insect Conservation Under the Endangered Species Act*, UCLA J. ENVT'L. L. & POL'Y 97, 98 (2007).

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I. INTRODUCTION

A recent study has valued the ecological services insects provide within the U.S. at \$57 billion,² and this figure is gauged by many to be an underestimate.³ Yet humans have increased the rate of extinction of insects exponentially.⁴ In the U.S., insects are an underrepresented class of animal in the Endangered Species Act due to the way the act is constructed.⁵ Additionally, current treaties banning trade of endangered species are seldom relevant to insects because they are rarely hunted. Sometimes extinctions go unnoticed, as there are not enough biologists to identify lost insect species. Indeed, five to eight million insect species remain undiscovered.⁶ We

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2. Losey & Vaughan, *supra* note 1, at 311.
 3. *Id.* at 311, 320; Lugo, *supra* note 1, at 99.
 4. Lugo, *supra* note 1, at 99–100.
 5. *Id.* at 113–14. This is primarily due to the way the Endangered Species is set up, by monotypic genus. A monotypic genus has only one species, which is given a higher preservation priority because it is considered more genetically distinct. This preference biases insects as the number of monotypic genera is significantly lower for insects than it is for birds and mammals. *Id.*
 6. Scott Hoffman Black et al., *Endangered Invertebrates: The Case for Greater Attention to Invertebrate Conservation*, 18 ENDANGERED SPECIES UPDATE 42, 42 (2001); Lugo, *supra* note 1, at 99.

are well aware that if honeybees faced extinction, our food supply would be in a dire state. But many insects besides bees pollinate and contribute to modern society and our way of life.⁷

The monarch butterfly (*Danaus plexippus*) in particular still remains a wonder of science and a beauty of nature, in addition to being a pollinator. These butterflies migrate over 2,000 miles from Mexico to Canada over multiple generations, and researchers still do not know how the monarchs navigate their journey.⁸ Birds and mammals learn migratory routes from their parents, but butterflies do not live long enough to teach their offspring how to migrate.⁹

The monarch butterfly population has steadily declined since 1994.¹⁰ This is due primarily to three factors: (1) illegal logging in the Oyamel forests of Mexico, where the butterflies spend the winter; (2) a lack of milkweed plant hosts in the U.S. and Canada, possibly coupled with genetically modified crop effects; and (3) climate change.¹¹ Mexico, Canada, and the U.S. have signed protective migratory bird treaties, and a similar treaty is necessary for migratory insects to prevent the decline of the monarch butterfly and species like it.

This Note explores the current threats to monarch butterflies and how to remedy them through international law. Section II provides background on the monarch butterfly migration and threats to its population. Section III discusses current laws and treaties for other

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7. See Lugo, *supra* note 1, at 110–11.
 8. Karen S. Oberhauser & Michelle J. Solensky, *Preface*, THE MONARCH BUTTERFLY: BIOLOGY AND CONSERVATION, at vii (Karen S. Oberhauser & Michelle J. Solensky eds., 2004); *Conserving the Monarch Butterfly*, U.S. FISH & WILDLIFE SERV., <http://www.fws.gov/international/animals/monarch-butterfly.html> (last visited Dec. 30, 2014) [hereinafter USFWS].
 9. REBECCA G. HARVEY ET AL., NATIVE HABITATS FOR MONARCH BUTTERFLIES IN SOUTH FLORIDA 1 (Dep't of Wildlife Ecology & Conservation, Fla. Coop. Extension Serv., Inst. of Food & Agric. Scis., Univ. of Fla. Ser. No. WEC-266, rev. ed. 2012).
 10. Lincoln P. Brower et al., *Decline of Monarch Butterflies Overwintering in Mexico: Is the Migratory Phenomenon at Risk?*, 5 INSECT CONSERV. & DIVERSITY 95, 95–96 (2012) (“[T]he decline in abundance is statistically significant using both linear and exponential regression models. . . . This decline calls into question the long-term survival of the monarchs’ migratory phenomenon”) [hereinafter *Decline of Monarch Butterflies*].
 11. *Id.* at 95 (“Three factors appear to have contributed to reduce monarch abundance: degradation of the forest in the overwintering areas; the loss of breeding habitat in the United States due to the expansion of GM herbicide-resistant crops, with consequent loss of milkweed host plants, as well as continued land development; and severe weather.”).

migrating species. Section IV then proposes a draft migratory insect treaty to aid monarch butterflies and insects like them.

II. THE UNUSUAL CIRCUMSTANCE OF THE MONARCH BUTTERFLY

Every year, about 60 to 120 million monarch butterflies migrate from the forests of central Mexico to the U.S. and Canada.¹² Remarkably, through multiple generations,¹³ monarchs migrate over 3,000 miles, and offspring along the way instinctively know their course.¹⁴ How the new generation finds its bearings with such remarkable accuracy is still a mystery of science.¹⁵

The North American monarch population is split into Eastern and Western populations.¹⁶ The Eastern population is found east of the Rocky Mountains and spends the winter in Mexico, while the Western population spends the winter in California.¹⁷ The Eastern population breeds from the southern U.S. to southern Canada as well as from the Atlantic coast to the Rocky Mountains. The Western population

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12. USFWS, *supra* note 8; *Catastrophic Mortality at the Monarch Overwintering Sites in Mexico*, MONARCH WATCH NEWS (Feb. 11, 2002), <http://www.monarchwatch.org/news/021102.html>.
 13. KAREN S. OBERHAUSER ET AL., MONARCH BUTTERFLY MONITORING IN NORTH AMERICA: OVERVIEW OF INITIATIVES AND PROTOCOLS 9 (2009), *available at* http://www.fs.fed.us/wildflowers/pollinators/monarchbutterfly/documents/Monarch-Monitoring_en.pdf (“While monarchs that develop during the summer are reproductive soon after enclosing, butterflies emerging in late summer or early fall delay reproduction. This period of reproductive arrest is termed diapause, and allows monarchs to use the energy that would have gone towards egg and spermatophore production for flying. In addition, the energy saved allows the migratory generation to live all winter, up to nine months. . . . “The fall migration starts in late August and early September in the northern United States and southern Canada. Traveling between 80 and 160 kilometers (km) per day, these migrants are joined by additional monarchs along the way and reach the southern United States in late September and October.”). By contrast, the population of Western monarchs, west of the Rocky Mountains, also migrate, but do so over a shorter distance. These monarchs overwinter along the coast of California, rather than Mexico. *Id.* at 10.
 14. USFWS, *supra* note 8; Frank Mazzotti, HARVEY ET AL., *supra* note 9, at 1.
 15. HARVEY ET AL., *supra* note 9, at 1.
 16. OBERHAUSER ET AL., *supra* note 13, at 6; HARVEY ET AL., *supra* note 9, at 1.
 17. OBERHAUSER ET AL., *supra* note 13, at 9–10; USFWS, *supra* note 8.

ranges from the Rocky Mountains to the Pacific coast and from the Canadian border to the southern U.S.¹⁸

One reason that monarchs require special protection is their dependence on particular plants.¹⁹ Monarchs must lay their eggs on milkweed plants, which are essential to larvae survival.²⁰ Monarchs complete “almost all of their growth during the larval stage,”²¹ and remarkably, about 90 percent of eggs die during the egg and larval stages.²² With such a low survival rate, it is critical that plant and environmental conditions are adequate.

Monarchs are susceptible to harm when environmental needs are not met. Eggs do not hatch in dry conditions, and young larvae may perish at high temperatures. For instance, 95° Fahrenheit is lethal to each stage. Temperatures below freezing can also kill,²³ and rain compounded with cold temperatures is an especially deadly combination. According to some experiments, 5 percent of wet monarchs freeze to death at temperatures of -3.0° Celsius, 50 percent at -4.0° Celsius, and 80 percent at -5.0° Celsius.²⁴ This problem is exacerbated as forest degradation exposes monarchs to rain and wind, thus increasing the risk of mass freezing.

In addition to moderate climate, monarchs require particular environmental conditions in order to complete their long migration. They must be able to: (1) overwinter in Mexico or California; (2) hatch and grow with nourishing milkweeds in the U.S. and Canada; and (3) have safe passage free of environmental hazards on the journey from Mexico to the U.S. and Canada. Unfortunately, monarch butterflies are increasingly vulnerable at every stage of this migration.

18. OBERHAUSER ET AL., *supra* note 13, at 6.

19. See Karen S. Oberhauser, *Overview of Monarch Breeding Biology*, in THE MONARCH BUTTERFLY: BIOLOGY AND CONSERVATION, *supra* note 8, at 3.

20. *Id.* To further explain, larvae require cardenolides from said plants in order to survive and grow, a phenomenon discovered by Swiss Nobel laureate Tadeus Reichstein. Stephen B. Malcolm & Myron P. Zalucki, *The Monarch Butterfly: Research and Conservation*, in BIOLOGY AND CONSERVATION OF THE MONARCH BUTTERFLY 4 (Stephen B. Malcolm & Myron P. Zalucki eds., 1993).

21. Oberhauser et al., *supra* note 13, at 7.

22. *Id.*

23. Lincoln P. Brower et al., *Catastrophic Winter Storm Mortality of Monarch Butterflies in Mexico During January 2012*, in THE MONARCH BUTTERFLY: BIOLOGY AND CONSERVATION, *supra* note 8, at 151, 151 [hereinafter *Catastrophic Winter Storm*].

24. *Id.* at 162.

A. *The Population Decline*

Existing laws are not curbing the population decline of monarch butterflies.²⁵ As shown in a recent study, the monarch population has been steadily declining since 1994.²⁶ Three factors contribute to the problem: degradation of forests in Mexico, climate change, and loss of breeding habitat in the U.S.²⁷ This Note will address each in turn.

1. Forest degradation in Mexico and climate change

Illegal commercial logging has significantly reduced Mexican forests. A study performed by the Geography Institute of Universidad Nacional Autónoma de México (UNAM) revealed that 44 percent of high-quality forests in the Monarch Butterfly Biosphere Reserve were degraded between 1984 and 1999.²⁸ Some biologists conclude that illegal logging is a more severe problem for monarch butterflies than is agricultural clearing.²⁹ Research has revealed that monarchs need forest cover as an umbrella to protect them from the cold.³⁰ Furthermore, clustered butterflies were found to have “significantly higher lipid mass, water content, lean mass, and larger wings than did monarchs collected from flowers,”³¹ demonstrating that an intact, closed forest is necessary for successful overwintering, allowing monarchs to conserve lipid reserves for the long spring migration.³²

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25. See *Decline of Monarch Butterflies*, *supra* note 10, at 95 (indicating that the population of overwintering monarchs has been declining for fifteen years and is at an all-time low).
26. *Id.* at 96.
27. COMM’N FOR ENVTL. COOP., NORTH AMERICAN MONARCH CONSERVATION PLAN 6, 27 (2008) [hereinafter NAMCP], available at http://www.mlmp.org/Resources/pdf/5431_Monarch_en.pdf.
28. Mónica Missrie, *Design and Implementation of a New Protected Area for Overwintering Monarch Butterflies in Mexico*, in THE MONARCH BUTTERFLY: BIOLOGY AND CONSERVATION, *supra* note 8, at 141; Lincoln P. Brower et al., *Quantitative Changes in Forest Quality in a Principal Overwintering Area of the Monarch Butterfly in Mexico, 1971–1999*, 16 CONSERV. BIOLOGY 346, 346 (2002).
29. J. Honey-Rosés, *Disentangling the Proximate Factors of Deforestation: The Case of the Monarch Butterfly Biosphere Reserve in Mexico*, 20 LAND DEGRADATION & DEV. 22, 22 (2009).
30. J.B. Anderson & L.P. Brower, *Freeze-protection of Overwintering Monarch Butterflies in Mexico: Critical Role of the Forest as a Blanket and an Umbrella*, 21 ECOLOGICAL ENTOMOLOGY 107, 107 (1996); *Catastrophic Winter Storm*, *supra* note 23, at 151.
31. Alfonso Alonso-Mejía et al., *Use of Lipid Reserves by Monarch Butterflies Overwintering in Mexico: Implications for Conservation*, 7 ECOLOGICAL APPLICATIONS 934, 934 (1997).
32. See Anderson & Brower, *supra* note 30, at 108.

Scientists have consistently witnessed the severe effects of forest thinning on monarchs, as insufficient cover increases the insects' risk of freezing.³³ In 2010, a single storm blew hundreds of trees down in the Monarch Butterfly Special Biosphere Reserve, and researchers estimated that over fifty percent of monarchs were killed.³⁴ Had the temperature drop to -6.0° Celsius occurred while the monarchs were still wet, rather than on the second morning when they had dried, there would have been a shocking over 90 percent mortality rate.³⁵ Thus, a combination of severe weather and degraded forests is devastating to the monarch population.³⁶

Earlier, in 1981, a colony known as the “Zapatero overwintering colony” in the Sierra Chincua region of Mexico was shattered by severe weather conditions, causing 2.7 million monarchs to die in a ten-day storm.³⁷ In 1992, prolonged cold and cloudy weather caused an 80 percent population reduction in the Sierra Herrada colony.³⁸ It was discovered that the body temperatures of monarchs had dropped to 15° Celsius below freezing. Later, in 2002, a storm with heavy rain and snow caused an estimated 500 million monarch deaths across multiple colonies in central Mexico.³⁹ Of two colonies tested by scientists, an estimated 75 percent of monarchs were killed due to the 2002 storm.⁴⁰ While the effects of climate change are outside the scope of this Note, forest degradation is an issue that the proposed treaty

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33. OBERHAUSER ET AL., *supra* note 13, at 9 (noting that monarch butterflies are “essentially a tropical species, and cannot survive freezing conditions”).
34. *Decline of Monarch Butterflies*, *supra* note 10, at 98.
35. *Id.*
36. *See Catastrophic Winter Storm*, *supra* note 23, at 152 (“Recognition during the 1980s that forest thinning in and near the overwintering sites posed a severe threat to monarchs resulted in the designation of their migration and overwintering biology as an endangered biological phenomenon.”).
37. *Id.* at 151. (estimating that “418 monarchs were killed per square meter in the 0.65-ha colony”); *see also* William H. Calvert & James A. Cohen, *The Adaptive Significance of Crawling Up Onto Foliage for the Survival of Grounded Overwintering Monarch Butterflies (Danaus plexippus) in Mexico*, 8 ECOLOGICAL ENTOMOLOGY 471, 473 (1983) (noting that at times, “a small differential in above-ground height and temperature could make a difference between life or death of the butterfly”).
38. *Catastrophic Winter Storm*, *supra* note 23, at 151 (“We hypothesized that the butterflies had been killed by the combination of wetting and the subsequent clearing that results in extreme radiant heat loss to the cloudless sky.”).
39. *Id.* at 162.
40. *Id.*

addresses, and severe weather trends increase the urgency of such measures.

The rate of forest degradation in Mexican overwintering sites has been increasing since 1971.⁴¹ According to the World Wide Fund for Nature and the Mexican Nature Conservation Fund (FMNC), illegal logging has caused most of the deforestation.⁴² Additionally, ecotourism to overwintering sites in Mexico can have a degrading impact on monarch habitat, as many sites are not regulated and protective measures may not be in place.⁴³

Socio-economic factors also create particular complications in Mexican forest conservation. The Mexican population has a growing demand for wood,⁴⁴ and low wages coupled with a mafia-style association linked to the timber industry pressure locals (sometimes under threats of violence) to participate in illegal logging.⁴⁵ As logging profits are much higher than local wages, many are willing to risk arrest. High unemployment triggered by the shutdown of the mining industry in the 1980s, paired with very fragmented land ownership, contribute to the deforestation problem.⁴⁶

2. Breeding Habitat: The effects of lack of milkweed hosts and genetically modified corn

Milkweed plants are essential for monarch butterfly survival.⁴⁷ Unfortunately, agricultural trends are posing a risk to monarch populations in both the U.S. and Canada, where milkweed growth is threatened.⁴⁸ A large proportion of corn and soybeans grown in the

41. NAMCP, *supra* note 27, at 24.

42. *Id.* (“Since 2001, WWF-Mexico and the Mexican Nature Conservation Fund (FMCN) have annually monitored forest loss in the core and buffer areas of the MBBR, and have reported losses of over 560 hectares in a single year.”).

43. *Id.* at 25 (“In spite of thirty years of experience, tourism continues to be poorly organized.”).

44. Ludger Brenner & Hubert Job, *Actor-Management of Protected Areas and Ecotourism in Mexico*, 5 J. LATIN AM. GEOGRAPHY 7, 7–10, 16–18 (2006).

45. *Id.* at 16.

46. *Id.*

47. NAMCP, *supra* note 27, at 4. Recall that larvae require cardenolides from milkweed plants in order to survive and grow. Malcolm & Zalucki, *supra* note 20, at 4. See also Oberhauser, *supra* note 19, at 3 (“[Milkweeds are] the only group of plants that provide food for developing larvae.”).

48. See *Conservation and Preservation: Threats to Monarchs*, Flight of the Butterflies, <http://www.flightofthebutterflies.com/conservation-preservation/> (last visited Dec. 30, 2014).

U.S. are genetically modified. The result is a decrease in milkweed diversity and abundance.⁴⁹ Climate change and ozone damage also have negatively affected milkweed populations. Furthermore, milkweed plants that formerly grew by roadsides have in many parts been eradicated as “noxious weeds.”⁵⁰ Studies have shown that abundance and distribution patterns of milkweed plants affect reproduction and survival of immature monarchs.⁵¹ By altering the population of milkweeds, humans have in turn affected the monarch butterfly population.

Corn that is genetically modified to contain *Bacillus thuringiensis* (“Bt toxin”), a biological pesticide, may also impact monarch larvae.⁵² Some studies appear to show that pollen and anthers from modified corn negatively affect the larvae due to the pesticide.⁵³ Yet there are both costs and benefits to such genetic modification. Use of Bt corn also decreases the quantity of insecticide spraying, which is advantageous to monarchs.⁵⁴ Given these two principles, and given

49. NAMCP, *supra* note 27, at 23. The genetic modification allows for repeated application of glyphosate, which results in fewer weeds such as milkweed plants. The best surviving species of milkweed, known as *Asclepias syriaca*, is itself unable to survive after repeated application of glyphosate, which is the current trend. *Id.*

50. *Id.* at 23–24.

51. See Zalucki M.P & W.A. Rochester, *Estimating the Effect of Climate on the Distribution and Abundance of Danaus Plexippu: A Tale of Two Continents*, in 1997 NORTH AMERICAN CONFERENCE ON THE MONARCH BUTTERFLY 151–63 (J. Hoth et al. eds., 1997); Karen S. Oberhauser, *Modeling the Distribution and Abundance of Monarch Butterflies*, in THE MONARCH BUTTERFLY: BIOLOGY AND CONSERVATION, *supra* note 8, at 199, 201.

52. NAMCP, *supra* note 27, at 23. Repeatedly, studies have shown that Bt toxins have a negative impact on monarch larvae, but such findings have also brought criticisms. See Laura C. H. Jesse & John J. Obrycki, *Survival of Experimental Cohorts of Monarch Larvae following Exposure to Transgenic Bt Corn Pollen and Anthers*, in THE MONARCH BUTTERFLY: BIOLOGY AND CONSERVATION, *supra* note 8, at 69, 69 (stating the “EPA reassessment was in response to the laboratory study by Losey and coworkers (1999) which demonstrated that monarch larvae ingested Bt corn pollen when they were placed on milkweed leaves covered with pollen and that consumption of this pollen caused increased mortality.”). Criticisms emphasize that “pollen collection methods failed to exclude anthers.” *Id.*

53. NAMCP, *supra* note 27, at 23. One study observed, “a trend toward higher rates of mortality of larvae in Bt cornfields.” Jesse & Obrycki, *supra* note 52, at 74.

54. See NAMCP, *supra* note 27, at 23, 27; Oberhauser, *supra* note 19, at 4 (“Monarch eggs and larvae have a slim chance of reaching adulthood . . . previous studies documented mortality rates of over 90% during the egg and larval stages. . . . There are both abiotic and biotic sources of monarch mortality during the breeding season. Abiotic (nonliving)

that there is still scientific debate over the effects of Bt toxin on monarchs, there is no consensus as to whether butterflies are at an advantage having less insecticide and more genetically-modified corn or having more insecticide and less genetically modified corn.⁵⁵ Thus, until the costs and benefits of genetic modification are more clearly delineated, any ban on genetic modification should not be included in a treaty. An amendment upon further scientific research, perhaps, would be more appropriate.

In summary, there are three major causes of monarch butterfly population decline: forest degradation, climate change, and a lack of milkweed hosts in the U.S. and Canada with possible contributing effects of genetically modified crops. Since the problems span three countries, it is imperative to unpack the relevant laws of each territory and determine methods of improving the monarchs' chances of survival.

B. A Comparison of Monarch Butterfly Laws: Mexico, Canada, and the U.S.

The Mexican government has enacted three federal decrees to protect monarch butterfly habitat.⁵⁶ In 2000, there was a presidential decree for the Monarch Butterfly Biosphere Reserve.⁵⁷ The Mexican government has listed the monarch butterfly as “under special protection” in the Species at Risk standard.⁵⁸ According to Mexican

factors include environmental conditions such as adverse weather and pesticides.”).

55. NAMCP, *supra* note 27, at 23–24, 27. Studies are not conclusive in this area. The results of Stanley-Horn reported “no increase in mortality” as a result of Bt11 cornfields. Jesse & Obrycki, *supra* note 52, at 74.
56. NAMCP, *supra* note 27, at 32 (“The first (1980 decree) protected the monarch overwintering areas without specifying the locations to be conserved and restricted extractive activities in the forests only during the overwintering season (November to March). The second (1986 decree) defined for protection 16,110 hectares in five discrete areas along the border of the states of México and Michoacán. . . . Together these five areas were called the Special Monarch Butterfly Biosphere Reserve (SMBBR). Each area had a core and buffer zones, with a total of 4,491 ha in the core zones and 11,619 ha in buffer zones.”).
57. NAMCP, *supra* note 27, at 32; *see also* Missrie, *supra* note 28, at 147 (stating that the negotiation process ended with a “new decree by President Ernesto Zedillo on 10 November 2000, expanding the reserve from 16,100 to 56,259 ha, and changing its official designation from the Monarch Butterfly *Special* Biosphere Reserve to the Monarch Butterfly Biosphere Reserve. . . . The new reserve is more than triple the size of the original 1986 reserve.”).
58. NAMCP, *supra* note 27, at 32. Additionally, monarch butterflies' winter roosts have been designated as “threatened phenomena” by the International Union for Conservation of Nature and Natural Resources. *Id.* at 28.

laws, no forest exploitation is allowed in the core area of the Monarch Reserve.⁵⁹ Furthermore, the monarch butterfly reserve in the Oyamel forests has been designated a UNESCO World Heritage Site.⁶⁰

The World Heritage Centre works together with the technical advisory body, known as the International Union for Conservation of Nature and Natural Resources (IUCN), to ensure protection and conservation of natural heritage sites in the long term.⁶¹ In order to accomplish this, the IUCN conducts monitoring missions in cooperation with site management agencies to evaluate the current state of particular sites and also attempts to provide building capacity and technical assistance.⁶² The World Heritage Centre has partnered with several organizations for international support to aid its efforts.⁶³ Partnership organizations include, but are not limited to, non-governmental organizations such as the World Wide Fund for Nature, the Wildlife Conservation Society, the Nature Conservancy, Fauna and Flora International, and Conservation International. Collaboration between partners facilitates project implementation and provides assistance to the IUCN.⁶⁴ The Advisory Committee for Biosphere Reserves, a body that reports to UNESCO's Director-General, recommends greater cooperation with Canadian and U.S. authorities, who control key sites along the monarchs' route of migration.⁶⁵

In Canada, the monarch butterfly is listed as a species of special concern under the Species at Risk Act (SARA) due to both biological characteristics and identifiable threats to the population.⁶⁶ In 2003, SARA was established as a legislative process for assessing, listing,

59. While laws prohibit logging in protected areas, illegal logging is still occurring. Missrie, *supra* note 28, at 147 (“The majority of local campesinos want to see an end to illegal cutting, which benefits only a few . . . [yet] enforcement of the no-logging rule needs to be addressed.”).

60. *World Heritage List: Monarch Butterfly Biosphere Reserve*, UNESCO WORLD HERITAGE CTR., <http://whc.unesco.org/en/list/1290> (last visited Dec. 30, 2014).

61. *World Heritage Centre's Natural Heritage Strategy*, UNESCO WORLD HERITAGE CTR., <http://whc.unesco.org/en/naturalheritagestrategy/> (last visited Dec. 30, 2014). The IUCN designated the monarch butterfly migration as a threatened biological phenomenon. NAMCP, *supra* note 27, at 28.

62. *World Heritage Centre's Natural Heritage Strategy*, *supra* note 61.

63. *Id.*

64. *Id.*

65. NAMCP, *supra* note 27, at 28.

66. *Id.* at 30–31.

and recovering species at risk.⁶⁷ Canada also enacted the Canada National Parks Act, which specifically protects monarch butterflies at Point Pelee National Park in Ontario.⁶⁸ Furthermore, Canada and Mexico signed a declaration to create an International Network of Monarch Butterfly Reserves in 1995.⁶⁹ Thus three areas in southern Ontario were designated as monarch butterfly reserves: Point Pelee National Park, Long Point National Wildlife Area, and Prince Edward Point National Wildlife Area. These were also protected prior to the declaration.⁷⁰

Similar to Canada's Species at Risk Act, the U.S. enacted the Endangered Species Act.⁷¹ Yet the U.S. does not list the monarch butterfly as endangered under the law nor does it designate the species with any special status.⁷² Furthermore, unlike both Mexico and Canada, the U.S. does not have federally designated land for butterflies.⁷³ Instead, the U.S. has city ordinances, state law plans, and coastal zone management, which are not unified and provide only piecemeal protection. In California, for example, voters approved a bond issue that allocated \$2 million to purchase overwintering habitat for monarch butterflies.⁷⁴ Some towns have city ordinances to prevent disturbance of habitats as well. Yet there is no unified federal plan. Rather, the majority of monarch conservation efforts in the U.S. are led by a host of NGOs and universities. For example, the Monarch Watch program through the University of Kansas creates way stations that provide monarch nectaring and breeding habitats in Kansas.⁷⁵

The Commission for Environmental Cooperation (CEC) comprises Canada, Mexico, and the U.S., and was established by the North

67. *Id.* at 30.

68. *Id.* at 31. Additionally, the Fish and Wildlife Conservation Act, passed by the Legislature of the Province of Ontario in 1997, gave "special status" to "a number of invertebrate species, including the monarch butterfly." *Id.*

69. NAMCP, *supra* note 27, at 31.

70. *Id.*; COMM. ON THE STATUS OF ENDANGERED WILDLIFE IN CAN., COSEWIC ASSESSMENT AND STATUS REPORT ON THE MONARCH *DANAUS PLEXIPPUS* IN CANADA 15 (2010), *available at* http://publications.gc.ca/collections/collection_2011/ec/CW69-14-597-2010-eng.pdf.

71. Endangered Species Act, 16 U.S.C. §§ 1531–1544 (2013).

72. *See* NAMCP, *supra* note 27, at 31.

73. *See id.* at 16, 30–31.

74. *Id.* at 31.

75. *Id.*

American Agreement on Environmental Cooperation (NAAEC).⁷⁶ One of the CEC's initiatives is to protect monarchs along monarch flyways,⁷⁷ and the 2008 North American Monarch Conservation Plan (NAMCP)⁷⁸ further sets forth its comprehensive conservation efforts. The CEC has adopted a collaborative, multi-stakeholder approach that involves a host of NGOs and universities, all of which contributed to the NAMCP.⁷⁹

This Note proposes, among other obligations, that the U.S. federal government allocate land for monarch butterflies. This land will contain both milkweed plants for larva and nectar for adults, as the butterflies need both to survive and reproduce. This Note further recommends the formation of a migratory insect treaty, an agreement that would include the monarch butterfly, have signatories of the U.S., Canada, and Mexico, and foster cooperation and conservation incentives related to the monarch butterfly.

II. RELEVANT INTERNATIONAL TREATIES AND THEIR COMPLICATIONS

Existing international treaties do not help the monarch butterfly but provide a starting point in drafting an appropriate treaty. The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)⁸⁰ is designed to aid endangered species.⁸⁰ Although the Migratory Bird Treaties are similar in nature, they only apply to birds. The Convention on Migratory Species has applicable goals, as it is broader and already covers and protects several species of migratory animals.⁸¹ Soft law, such as the NAMCP,⁸² while not

76. *About the CEC*, COMM'N FOR ENVTL. COOP., http://www.cec.org/Page.asp?PageID=1226&SiteNodeID=310&BL_ExpandID=878 (last visited Dec. 30, 2014).

77. *Conserving the Monarch Butterfly and Promoting Sustainable Livelihoods*, COMM'N FOR ENVTL. COOP., http://www.cec.org/Page.asp?PageID=122&ContentID=2783&SiteNodeID=1284&AA_SiteLanguageID=1 (last visited Dec. 30, 2014).

78. NAMCP, *supra* note 27, at 5.

79. See Comm'n for Env'tl. Coop., *Council Resolution: 07-09*, Doc. No. C/C.01/07/RES/09/ (June 27, 2007); NAMCP, *supra* note 27, at 6.

80. See *What is CITES?*, CITES, <http://www.cites.org/eng/disc/what.php> (last visited Dec. 30, 2014).

81. See Migratory Bird Treaty Act, 16 U.S.C. §§ 703–719c (2013); Convention on Migratory Species, 10th Meeting, Bergen, Nor., Nov. 20–25, 2011, CMS Strategic Plan 2015–2023, UNEP/CMS/Resolution 10.5, *available at* http://www.cms.int/sites/default/files/document/10_05_strategic_plan_e_0.pdf; *Introduction to the Convention on Migratory Species*, CONVENTION ON MIGRATORY SPECIES, <http://www.cms.int/about/intro.htm> (last viewed Sept. 1, 2014).

enforceable, provides a baseline for a migratory insect treaty. A summary of each treaty follows below.

A. *The Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973)*

CITES, entered into force on July 1, 1975, is an international agreement between governments with a purpose to “ensure that international trade in specimens of wild animals and plants does not threaten their survival.”⁸³ The U.S., Canada, and Mexico are all parties.⁸⁴ The authors of the treaty aimed to decrease inter-country trade of endangered species, emphasizing a spirit of cooperation.⁸⁵ The treaty defines “species” as “any species, subspecies, or geographically separate populations thereof.”⁸⁶ This definition includes insects, which are listed within the treaty in Appendices I through III.⁸⁷ The treaty provides that any import of a specimen of a species listed in the appendix requires the prior grant of an import permit and either an export permit or a re-export certificate.⁸⁸

(stating that the Convention on the Conservation of Migratory Species (known as CMS) is backed by the United Nations Environment Program, and its purpose is to “conserve terrestrial, aquatic and avian migratory species throughout their range.”).

82. NAMCP, *supra* note 27. By soft law, the NAMCP does not have legally binding force like a treaty, but is a recommendation for actions of countries.
83. *How CITES Works*, CITES, <http://www.cites.org/eng/disc/how.php> (last viewed Sept. 1, 2014) (“CITES works by subjecting international trade in specimens of selected species to certain controls. All import, export, re-export and introduction from the sea of species covered by the Convention has to be authorized through a licensing system. Each Party to the Convention must designate one or more Management Authorities in charge of administering that licensing system and one or more Scientific Authorities to advise them on the effects of trade on the status of the species.”).
84. *List of Contracting Parties*, CITES, <http://www.cites.org/eng/disc/parties/alphabet.php> (last visited Dec. 30, 2014).
85. *What is CITES?*, *supra* note 80.
86. Convention on International Trade in Endangered Species of Wild Fauna and Flora art.1, Mar. 3, 1973, 27 U.S.T. 1087, T.I.A.S. No. 8249, 993 U.N.T.S. 243 [hereinafter CITES].
87. Convention on International Trade in Endangered Species of Wild Fauna and Flora, June 12, 2013, Appendices I, II and III, *available at* <http://www.cites.org/sites/default/files/eng/app/2013/E-Appendices-2013-06-12.pdf>.
88. CITES, *supra* note 86, arts. 3–5.

CITES applies to species that are hunted or captured, since the treaty regulates trade.⁸⁹ However, monarch butterflies are generally not hunted, and CITES does not play a role in curbing deforestation or combating other habitat problems the monarch population faces.⁹⁰ Further, monarch butterflies are not currently listed on CITES.⁹¹ Thus, at best, CITES can serve as the groundwork for a new treaty.

B. Migratory Bird Treaties

Similar to CITES, migratory bird treaties focus on hunting and capture. The earliest migratory bird treaty was the Migratory Bird Treaty Act (MBTA), concluded between the U.S. and Great Britain on August 16, 1916.⁹² The treaty between the U.S. and the United Mexican States for the Protection of Migratory Birds and Game Mammals was signed on February 7, 1936.⁹³ The MBTA was codified in 16 U.S.C. § 703, which rendered “taking, killing, or possessing migratory birds unlawful.”⁹⁴ The legislation further defines “take” as “construed to mean pursue, hunt, shoot, capture, collect, kill, or attempt to pursue, hunt, shoot, capture, collect, or kill, unless the context otherwise requires.”⁹⁵ Those convicted are fined up to \$15,000 or imprisoned for up to six months, or both.⁹⁶ Furthermore, 16 U.S.C. § 706 includes “[a]ll birds, parts, nests, or eggs”⁹⁷

Much like nests to bird chicks, milkweeds are essential to monarch larvae survival—monarchs are dependent on milkweed plants. Any new potential treaty should address the diminishing milkweed population and include limits and controls on the amount of milkweed planted due to variances in the amount of plants needed to sustain local populations. This idea is further explained in Section IV, which outlines the contours of a migratory insect treaty.

89. See *What is CITES*, *supra* note 80.

90. Monarchs are not listed in the CITES appendices and are thus not protected. Therefore, CITES does not address deforestation and other associated conservation issues related to monarchs. See *The CITES Species*, CITES, <http://www.cites.org/eng/disc/species.php>.

91. *Id.*; USFWS, *supra* note 8.

92. Migratory Bird Treaty Act, 16 U.S.C. § 703, §715j (“For the purposes of . . . the Migratory Bird Treaty Act, migratory birds are those defined as such by the treaty between the United States and Great Britain for the protection of migratory birds.”).

93. *Id.* § 715j. It should be noted that migratory bird laws have stiff penalties including fines and imprisonment. *Id.* § 707.

94. *Id.* § 703.

95. *Id.* § 715n.

96. *Id.* § 707(a).

97. *Id.* § 706.

C. “Soft Law” Monarch Conservation: *The North American Monarch Conservation Plan*

In December 2007, the CEC conference held in Morelia led to the creation of NAMCP, which proposes multilateral action between Mexico, the U.S., and Canada.⁹⁸ The NAMCP addresses specific objectives with regards to four categories: (1) threat prevention, control, and mitigation; (2) innovative enabling approaches; (3) research, monitoring, evaluation, and reporting; and (4) education, outreach, and capacity building.⁹⁹

The first of these categories concerns threat prevention, including deforestation of monarch overwintering habitats.¹⁰⁰ The NAMCP maintains that deforestation must be decreased and that tourism be sustained in a way that does not harm the monarch population.¹⁰¹ It further declares that the causes of decreased water availability must be examined and that the impacts of parasites be ascertained.¹⁰² With regard to the monarch flyway, the NAMCP proposes that the habitat degradation throughout the migratory path be addressed. The NAMCP suggests that fragmentation in monarch breeding grounds in the U.S. and Canada must be controlled, and new habitat management practices be implemented.¹⁰³ Furthermore, the NAMCP proposes that innovative enabling approaches¹⁰⁴ are essential to “[p]romote environmentally sustainable income sources for individuals and institutions whose current livelihood results in degraded monarch habitat.”¹⁰⁵ Lastly, the NAMCP explains the importance of monitoring monarch populations, analyzing socioeconomic factors, and evaluating conservation actions.

The NAMCP is a step in the right direction. However, it does not contain the enforcement mechanisms of a treaty, nor does it set forth specific mechanisms to achieve its ends. Consequently, the need for an enforceable treaty remains.

98. NAMCP, *supra* note 27, at 6.

99. *Id.* at 38–42.

100. *Id.* at 38. Threats to deforestation are both from “large-scale, organized illegal logging; large-scale, organized illegal logging; small-scale, illegal subsistence logging; legal logging; and habitat conversion.” *Id.*

101. *Id.*

102. *Id.*

103. *Id.* at 39, 41. This includes a data exchange between the three countries and a record of conservation actions, as well as distribution of monitoring toolkits, among other things. *Id.*

104. In other words, the NAMCP promotes new approaches to encourage conservation. It mentions environmentally friendly fair trade programs, for instance. *Id.* at 40.

105. *Id.*

D. *Convention on Migratory Species*

The Convention on Migratory Species (CMS), backed by the U.N. Environment Program, aims to “conserve terrestrial, aquatic and avian migratory species throughout their range.”¹⁰⁶ It acts as a framework convention. There is a range of agreements, from legally binding treaties (deemed Agreements) to less formal instruments, such as memoranda of understanding. The U.S. is not a party to CMS, but it has agreed to three memoranda of understanding, while Canada and Mexico are neither parties to CMS nor to any other agreements under its supervision.¹⁰⁷ Thus far, agreements exist concerning populations of European bats, cetaceans of the Mediterranean Sea, and African-Eurasian migratory water birds, among others. Memoranda of understanding include species such as the Siberian crane and the African marine turtle.¹⁰⁸ Most species appear to be in Eurasia and Africa, and the CMS does not currently protect any species of insect. While the monarch is listed in Appendix II to the CMS, recognizing it as a species ripe for an international conservation agreement, no such agreement has yet been made.¹⁰⁹

E. *The Problem with Laws Emphasizing Trade and Hunting*

As stated above, CITES and the aforementioned migratory bird treaties focus on hunting and trade.¹¹⁰ The essential problem with this approach for monarch protection is that humans rarely hunt and

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106. CONVENTION ON THE CONSERVATION OF MIGRATORY SPECIES OF WILD ANIMALS (Sept. 1, 2014), <http://www.cms.int/>; *CMS*, <http://www.cms.int/en/legalinstrument/cms> (last visited Dec. 30, 2014).
107. *See, e.g.*, Conference of the Parties on the Convention on Migratory Species, Nairobi, Kenya, Nov. 20-25, 2005, *Agreement Summary Sheets of the Convention on the Conservation of Migratory Species of Wild Animals (CMS)*, U.N. Doc. UNEP/CMS/Inf. 8. 10 (July 25, 2005) (showing the U.S. as a party to a Memorandum of Understanding concerning conservation of marine turtles); *see Parties and Range States*, CMS, <http://www.cms.int/en/parties-range-states> (last updated May 1, 2014).
108. *See Agreements*, CMS, <http://www.cms.int/en/cms-instruments/agreements> (last visited Dec. 30, 2014); *Memoranda of Understanding*, CMS, <http://www.cms.int/en/cms-instruments/mou> (last visited Dec. 30, 2014).
109. Convention on the Conservation of Migratory Species of Wild Animals, Appendices I, II, Feb. 23, 2012, *available at* http://cms.eaudeweb.ro/sites/default/files/instrument/appendices_e.pdf; Convention on the Conservation of Migratory Species of Wild Animals art. 4, June 23, 1979, 1651 U.N.T.S. 356.
110. *What is CITES?*, *supra* note 80; Migratory Bird Treaty Act, 16 U.S.C. § 715n.

trade insects.¹¹¹ Furthermore, insects are underrepresented in the Endangered Species Act.¹¹² This is likely due in part to the Fish and Wildlife Service's decision to use monotypic genera as a proxy for genetic distinctiveness.¹¹³ A monotypic genus has only one species, and the number of monotypic genera is significantly lower for insects than it is for birds and mammals.¹¹⁴ The Endangered Species Act allocates "critical habitat"¹¹⁵ to be preserved for threatened or endangered species, meaning "the specific areas within the geographical area occupied by the species . . . on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection."¹¹⁶ The U.S. does not list monarch butterflies under the Endangered Species Act,¹¹⁷ so they are not afforded any special protection in the U.S. despite the fact that they have special status under the Species at Risk Act in Canada.¹¹⁸

IV. DRAFT TEXT OF MIGRATORY INSECT TREATY WITH COMMENTARY

A draft text of a migratory insect treaty is set forth below with specific regard to the protection of monarch butterflies. Commentary follows each section delineating how the treaty should be interpreted and the rationale for the construction of each section.

MIGRATORY INSECT TREATY

The Contracting States,

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111. Note that while there are insect collectors and one can purchase insect collections, this is on a small scale in relation to the number of insects. There are millions of insects that have never even been identified. Lugo, *supra* note 1, at 99.
112. *Id.* at 101.
113. *Id.* at 113–14.
114. *Id.*
115. Habitat is the area where the species typically lives and is accustomed to. The critical region the ESA preserves is the area specifically used by the species. Endangered Species Act of 1973, 16 U.S.C. §§ 1531, 1532(5) (2013).
116. *Id.* § 1532(5)(A)(i)(I)-(II).
117. *Id.* § 1531(a)(4) (showing the scope of the Endangered Species Act, which does not encompass any insect protection).
118. See explanation of SARA *infra* Section II.B.

Recognizing that migratory insects are valuable from aesthetic, scientific, and economic perspectives;

Convinced that once a particular species goes extinct, it cannot be recovered;

Agree as follows:

Article I: Definitions

For the purpose of this treaty,

- (a) “Species” means any species, subspecies, or geographically separate population thereof.
- (b) “Scientific Authority” means a national scientific authority designated by the Commission on Environmental Cooperation (CEC).
- (c) “Management Authority” means a national management authority designated in accordance with the CEC and local government.
- (d) “Endangered Migratory Insect Species” will include the monarch butterfly (*Danaus plexippus*).
- (e) “Party” means a State for which the present treaty has entered into force.
- (f) “Actor” is defined as an individual, group, or organization that has an impact upon the environmental area of interest, including both place-based actors (e.g., local farmers and hunters) and non-place-based actors (e.g., political leaders, corporations, and government institutions).

COMMENTARY

Article 1 defines terms used in the treaty. It adapts definitions from the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). “Scientific Authority” and “Management Authority” here, by contrast to CITES, are designated by the Commission on Environmental Cooperation (CEC). The rationale is that the CEC has already demonstrated a purpose and determination for conservation of migratory insects and will therefore have the proper motivations of conservation when approving Scientific Authorities. The CEC is less likely to be swayed by political interests than would a government-appointed Scientific Authority. The definition of “Management Authority” recognizes that a regional manager must be approved both by the CEC and by the local government because a Management Authority will be overseeing efforts in a particular region, and therefore his or her job duties shall be directly intertwined with the environment of the local area and

government. Ideally the Management Authority and Scientific Authority will work closely together. The specificity of the definitions is intended to ensure that the CEC contributes to the determination of experts who will oversee the implementation of the treaty.

The definition of “Species” has been derived directly from CITES because this is an adequate and inclusive definition, and the same purpose is served here.

The definition of “Actor” is designed to facilitate discussion of the complex problems involved in ecotourism and is modeled after geographic studies in Mexico.

Article II: Fundamental Principles

1. This treaty shall cover migratory insects, which have been nominated by one of the Contracting States for inclusion in the list.
2. The first insect on the list shall be the monarch butterfly (*Danaus plexippus*), henceforth included by the enactment of this treaty.
3. Appendix I shall include all insect species that are threatened and require immediate relief through Migratory Insect Treaty protection.

COMMENTARY

Article II.1 permits nominations of migratory insects by Parties with the intent of protecting any threatened migratory insect. The rationale is both economic and political. Insects have a variety of uses particularly for pollination.¹¹⁹ Additionally, the sheer biomass of migratory insects is enormous.¹²⁰ The biomass of monarch butterflies alone is 40 to 80 tons,¹²¹ while the biomass of dragonflies is 4,000 tons,¹²² and biomass of desert locusts is 200,000 tons.¹²³ By contrast,

119. See *Insects and Pollinators*, USDA NAT. RES. CONSERV. SERV., <http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/plantsanimal/s/pollinate/> (last visited Dec. 30, 2014); Eraldo M. Costa-Neto, *Animal-Based Medicines: Biological Prospection and the Sustainable Use of Zootherapeutic Resources*, 77 AN. ACAD. BRAS. CIENC. 33, 35 (2005) (explaining how insects are used as medicine).

120. See Richard A. Holland et al., *How and Why Do Insects Migrate?*, 313 SCI. 794, 794 (2006).

121. See *id.*

122. *Id.*

123. *Id.*

the biomass of Mexican free-tailed bats is 300 tons.¹²⁴ Scientists have long known that large-scale insect migrations have a huge impact on the welfare of humans particularly when one considers insects' effects on ecological waste, crops, diseases, and especially pollination. Additionally, many insects have pharmaceutical value. Over 500 species of insects, mites, and spiders are used as medicines to cure both common and complicated ailments. Promising anti-cancer compounds, for instance, have been found in a variety of insects including Asian sulfur butterflies (*Catopsilia crocale*).¹²⁵ A Party with a threatened migratory insect species could thus utilize the enforcement mechanisms of the Migratory Insect Treaty by nominating an insect for inclusion on the list and could sustain certain ecological aspects of the Party's economy in the process.

Article II.2 recognizes the monarch butterfly as the first species on the list. The monarch butterfly is a model insect because it traverses three countries: Mexico, the United States, and Canada, and its population is rapidly declining.¹²⁶ Current methods do not appear to be reducing the population decline, and enforcement of this treaty is necessary to affect change. The monarch butterfly will therefore be the first insect on the list of Endangered Migratory Insect Species that this treaty protects.

Article II.3 clarifies that migratory insect species to be protected will be listed in the Appendix. The monarch butterfly will be the first.

Article III: Measures to be Taken by the Parties

All Parties that have land on which the migratory species traverses shall participate in a conference to discuss a newly endangered migratory insect. Subsequently, Scientific Authorities, along with delegates from each Party, shall agree upon a conservation plan on or before fourteen calendar days from the day that the species is listed as endangered. Five delegates from each Party shall participate in the meeting, and at least two Scientific Authorities from each Party shall also participate.

Delegates from each Party shall establish a federally sponsored endangered insect census tracking program in order to accurately track the population of the endangered insect. Scientific Authorities shall generate a list of "hot spots," particular regions in the country that are of greatest importance to the particular species.

124. *Id.*

125. Costa-Neto, *supra* note 119, at 36.

126. *Decline of Monarch Butterflies*, *supra* note 10, at 95; USFWS, *supra* note 8.

Parties shall participate in a conference to determine if federal land needs to be allocated for the particular endangered insect.

COMMENTARY

Article III sets forth the actions to be taken by the Parties. The Migratory Insect Treaty provides the means of preserving monarch butterflies and species like them. It includes preservation of necessary habitat along the endangered insect's flight path. For the monarch butterfly, the treaty sets forth a plan to ensure ample milkweed is available along the monarch's flight path, protects its overwintering habitat, and emphasizes innovative conservation techniques. It would also foster cooperation between Mexico, the United States and Canada and require enforcement at the domestic level. In sum, a successful treaty to protect the monarch butterfly should include four elements: (1) federal land allocation for the monarch butterflies in the United States through highways and national parks; (2) a monitoring system for ecotourism in Mexico; (3) innovative conservation efforts such as eco-dollars; and (4) cooperation among the three countries to ensure compliance.

1. **The Monarch Butterfly (already endangered) is a Model Example.** The monarch butterfly is already an endangered migratory insect, and when this treaty is enacted, the relevant Parties shall initiate conservation efforts as follows.

- A. **Monitoring of Monarch Butterfly Population.**

Parties shall agree to follow the monitoring techniques summarized by Karen Oberhauser in her paper prepared for the CEC, "Monarch Butterfly Monitoring in North America: Overview of Initiatives and Protocols."¹²⁷

1. **Funding.** Citizens tagging programs,¹²⁸ North American Butterfly Association Counts,¹²⁹ and censuses at stopover sites¹³⁰ shall be monitored and funded by the state or local government, and the government shall set up similar waystations in other areas where waystations are lacking.

127. OBERHAUSER ET AL., *supra* note 13.

128. *Study Monarchs: Citizen Science Opportunities*, MONARCH VENTURE, <http://monarchjointventure.org/get-involved/study-monarchs-citizen-science-opportunities/> (last visited Dec. 30, 2014) (describing how citizen-scientists' collection of data, including through tagging programs of individual monarchs, can assist in conservation efforts).

129. NORTH AMERICAN BUTTERFLY COUNTS, http://www.naba.org/butter_counts.html (last visited Dec. 30, 2014).

130. *See* OBERHAUSER ET AL., *supra* note 13, at 13.

2. **Skills Training.** Texas Monarch Watch and Journey North¹³¹ shall be hired by the government to train others in waystations throughout the monarch migratory path. The Monarch Watch protocol of monitoring several growth stages (“phenophases”) for milkweeds, including, among others, the date of first emergence from soil, first flower bud, and first open flower shall be utilized.¹³²
3. **Leadership and Supervision.** Each Party’s respective government shall designate officials (“Regional Officials”) to particular areas to oversee monarch monitoring studies. Five Regional Officials will be assigned to the eastern population of monarch butterflies and two Regional Officials to the western population of monarchs. Regional Officials shall ensure that sufficient funds are provided for accurate counting of monarch butterflies and shall note trends in population improvement or decline, if any. Data gathered shall be shared with all Parties to the treaty.

COMMENTARY

Section III.1.A.1 provides a source of funding for monarch butterfly monitoring, utilizing existing waystations coupled with government funding.

Section III.1.A.2 specifies the method by which personnel will be trained adequately to monitor the monarch butterfly population. It also provides for monitoring of milkweed populations, which are essential to the existence of monarch butterflies in the United States. This section is designed to establish a cohesively organized system in which the government puts forth some funding towards training because scattered non-profit organizations do not alone create a unified system.

Section III.1.A.3 provides an organizational structure for monitoring programs with a larger number of managers focused on the Eastern population of monarchs, as it is the predominant population. The monitoring of trends in population is to ensure that

131. These are two groups that are dedicated to collecting data and tracking monarchs. *See id.* at 37–40.

132. *Id.* at 16.

methods are working and to prevent population decline. Data sharing was emphasized in the 2008 Monarch Conservation Plan (NAMCP),¹³³ and this section also expresses a preference for transparent data collection among the Parties.

B. Federal Land Allocation. Each Party shall allocate federal land to the monarch butterflies. Scientific Authorities shall meet with Regional Officials and local politicians in the region at issue in order to prepare a list of locations requiring urgent attention and areas to which the government could most easily devote land. Members at the meeting shall then vote on the proposed sanctuary candidates.

1. Highways. As determined by the Scientific Authority, each Party, with the exception of Mexico, that has highways along the monarch flight path and that at one point hosted milkweed plants¹³⁴ alongside it, shall replant milkweed plants according to the following formula.

A minimum total milkweed mileage is equal to:

$$(1/10) * (T) * (R)$$

Where variables are defined:

T = Total Mileage of Federal Highways in Party

R = Risk Factor Quotient, which shall range from 1 to 8, depending on the population levels of butterflies as determined by the Regional Official and the Scientific Authority. There will be some exceptions, including cases of extensive milkweed proliferation due to growing conditions, among other factors, as determined by the Scientific Authority.¹³⁵

133. NAMCP, *supra* note 27, at 37.

134. Areas adjacent to highways used to have many milkweed plants. Recently, though, they have been targeted and exterminated as noxious weeds. *Id.* at 24.

135. If, for instance, growing conditions are such that the milkweed can easily proliferate and take over the other plants, an appropriate amount will be planted, as determined by the Scientific Authority. The emphasis, once again, is on highways with land that previously housed

The government is encouraged to choose land by highways that previously housed and exterminated milkweeds and to avoid highways containing plants that do not interact well with milkweed. Mowing patterns shall be designed by Scientific Authorities so as not to interfere with monarch habitat needs.

2. **Exceptions.** With respect to a Party's highway, if: (1) the Party has plants alongside the highway that cannot coexist with milkweeds, (2) milkweeds are not native to the state of that highway, and (3) the population of monarch butterflies that hatches in that region is also negligible (below X% per hectare, an amount to be determined by Scientific Authorities), then the Party is not obligated to plant milkweeds by that highway.

COMMENTARY

Section III.1.B.1 provides a specific method for calculating how much milkweed to replant in a particular region. Scientific Authorities are given leeway in this formula and exceptions, as it is likely that one region may have different environmental needs than another, and perhaps milkweed grows especially fast in certain areas. Furthermore, exceptions are provided to ensure that if milkweed introductions are detrimental to a particular region, then such plans will not proceed. The addition of mowing plans was introduced by the NAMCP, and this section is designed to provide Scientific Authorities the power to oversee such plans.

2. **National Parks.** Each Party shall designate sanctuaries for monarch butterflies. These can be part of already existing national parks or new national parks.
 - a. **Determination of Location and Size of Sanctuaries.** The size and expansiveness of the parks shall be decided by Scientific Authorities of each particular region and approved by the Management Authority.
 - b. **Extenuating Circumstances.** If there is a political dispute, or if a reserve is simply not feasible given particular circumstances,

milkweeds naturally, with a goal of reinstating the natural environmental conditions.

then Parties shall hold a meeting to vote on alternative plans.

- c. **Land in the United States.** In the United States, the Party shall designate lands for the Eastern and Western populations of monarchs in areas along the migratory path shown in Appendix A, Figure 1.

COMMENTARY

Section III.1.B.2.a is designed to protect monarch butterflies by requiring that each Party designate sanctuaries for butterfly habitation. In the NAMCP, it was suggested that habitat loss be addressed in the forests of Mexico, the flyways, and breeding areas,¹³⁶ which essentially means all three countries participate. Rather than using broad language, this section emphasizes that sanctuaries in each country must be established and maintained. It recognizes that not all areas in these countries are environmentally similar; there are a wide variety of environmental, economic, and political considerations in particular states and countries, and for this reason, both Scientific Authorities and Management Authorities must be involved. Scientific Authorities will provide a more scientific perspective with the main objective of preserving the butterflies; the Management Authorities will couple these considerations with the conditions of a particular region and the needs of the people.

Section III.1.B.2.b recognizes that there may be extenuating circumstances in a particular country that hinder the preservation of habitats at a particular time, such as times of war, political unrest, and environmental disasters. This section establishes the criteria for creating an exception, namely that all the Parties must vote on an alternative agreement. It is critical that all Parties are involved in such an instance to preclude the possibility of one country single-handedly evading its duties by fabricating political impediments.

Section III.1.B.2.c specifies that in the United States specifically, since there are two populations of migrating monarchs, land must be allocated for each. The exact geographic regions of such lands are deliberately excluded from this treaty because the environment and climate are constantly changing, and Scientific Authorities are better qualified to adapt to and address environmental changes when determining the sanctuary regions.

136. NAMCP, *supra* note 27, at 36–37.

C. Incentivizing Conservation. Parties shall hold bimonthly meetings with the CEC, Management Authorities and Scientific Authorities to discuss innovative conservation efforts. Each year, each Party shall propose new programs to incentivize conservation.

1. Local Currency.¹³⁷ Each country should discuss the introduction of local currencies in particular municipalities and vote on currency implementation in particular areas. Management Authorities, Scientific Authorities, and local government officials will participate in arranging the vote.

a. Water Shortage in Mexican Oyamel Forests. If the country's municipality agrees by vote, water credits can be implemented to preserve water in the Oyamel forests. One of the problems monarch butterflies face is a lack of water.¹³⁸

137. Studies have shown that local currency stimulates the local economy of cities. See Rajshri Jayaraman & Mandar Oak, *The Signaling Role of Municipal Currencies in Local Development*, 72 *ECONOMICA* 597, 597 (2005). Ithaca dollars in Ithaca, New York are just one example. *Id.* They could be implemented in Mexico for the trees and in the U.S. for the milkweed. See also BERNARD LIETAER & JACQUI DUNNE, *RETHINKING MONEY: HOW NEW CURRENCIES TURN SCARCITY INTO PROSPERITY* 58–59 (2013) (describing the various advantages of local currencies, which can be used to incentivize people to plant trees).

138. A recent study has shown that local currency improves *ex ante* efficiency and may also cause *ex post* efficiency, creating greater economic productivity in the local community. Jayaraman & Oak, *supra* note 137, at 597. So, why not have an environmentally friendly local currency?

To understand how an environmental currency might work, let us take the example of water credits.

There are two possible ways that our ecological currency could function, the first would be localized, the second global.

Scenario 1: Suppose Joe lives in a county that has abundant water near a lake. Most people in his neighborhood use more water than they need. Now let us suppose that a local currency is introduced which is based on the amount of water a household saves per month. Joe reads about the Eco-credits in the local newspaper. He decides he could use a little extra money to take his friends out to dinner so he decides to turn off the water and earn some credits. The credits are posted into his online account at the end of the month. They are based on the number of liters of water a county has designated as necessary. When he logs into his account, he can print out coupons or “currency” which can be used only in his county or city. It serves his purpose because he can take friends out to dinner in the neighborhood. It helps the city because it fosters consumption of local businesses. It helps the environment

- b. **Farming Example.** One country might have a system that uses a simple program like an iPhone application, which can capture the image of milkweed that a farmer has planted and log the GPS coordinates. The system will then add credits to the farmer's account.
 - c. **Forestry Example.** As an added incentive, Mexican farmers could "adopt-a-tree" and use an application similar to the one used in the Farming Example, registering a tree's health to earn credits.
2. **Fair Trade Programs.** Fair trade programs that are environmentally friendly shall be proposed and voted on by Management Authorities and Scientific Authorities and subsequently aided by the government.
3. **Forest Restoration.** Efforts to restore forests shall be funded by the local government and aided by local non-profit organizations.
4. **New Ideas.** Parties may propose new methods for incentivizing conservation for incorporation into this treaty through amendments.

COMMENTARY

Section III.1.C discusses the need for innovative new approaches to conservation. While the NAMCP mentions the necessity of

because water wastage is decreased. The cost of implementing the system could be borne by the city or by the local government.

Scenario 2: Let us suppose now that the Eco-credits rather than being a local currency are used with wide borders and can be traded over a large geographic radius. In this case, Joe can log onto the Internet, view his Eco-credits, and trade them with someone for a good that he desires. Now what will the other person do with Eco-credits that she purchased from Joe? Let us suppose her name is Sandy and she lives in the desert. She actually needs water. As has been recently proposed, virtual water may be beneficial to certain countries with water scarcity issues. "Virtual water," as the term was coined in previously published material, means importation of crops that require lots of water to produce. Dik Roth & Jeroen Warner. *Virtual Water: Virtuous Impact? The Unsteady State of Virtual Water*, 25 AGRIC. & HUM. VALUES 257, 257 (2008). Such trading, if countries and individuals recognize the value, could be beneficial. ARJEN Y. HOEKSTRA & ASHOK K. CHAPAGAIN, GLOBALIZATION OF WATER: SHARING THE PLANET'S FRESHWATER RESOURCES 3 (2008).

innovative approaches, it does not offer many specifics. This treaty emphasizes that innovation is a priority.

Section III.1.C.1 recognizes the potential benefits of local currencies in aiding conservation, which is a new idea. While the Kyoto Protocol includes carbon credits,¹³⁹ local currency benefits are quite different and could prove especially useful in impoverished towns in Mexico. This section opens a dialog on the issue of local currency and proposes a vote in each country on whether local currency could be utilized in particular areas. Local currencies could be used in tiny towns, larger cities, or particular regions. The treaty does not specify which officials in the local government will participate as currency issues are regulated differently in each country, and a local currency would likely involve the local city council as well. Therefore, this section specifically provides that regional and Scientific Authorities play a role.

Section III.1.C.1.a deals with the water shortage problem introduced in the NAMCP. While the NAMCP recognizes the problem, it does not propose a method of addressing it. Issuing water credits is a novel method that may help mitigate wastage. It will provide positive incentives for conserving water and may also bolster the local economy in the process.

Section III.1.C.1.b gives one example of an incentive mechanism via a new technological idea that should be explored and could aid monarch butterflies.

Section III.1.C.1.c provides another area in which local credits or currencies could aid conservation efforts, specifically with respect to forests.

Sections III.1.C.1.a, b and c taken together are intended to provide a platform of creativity for the Parties and a basis for dialogue on local credits, local currencies, and digital currencies, many of which could jumpstart incentives for conservation in particular regions. This section recognizes that an open dialogue for new ideas is essential.

Section III.1.C.2 expresses a preference for fair trade programs and allows a means for their initiation. Environmentally friendly fair trade programs were recommended by the NAMCP.¹⁴⁰

139. See *The Carbon Connection*, CARBON TRADE WATCH, <http://www.carbontradewatch.org/carbon-connection/what-is-the-kyoto-protocol.html> (last visited Dec. 30, 2014).

140. NAMCP, *supra* note 27, at 40.

Section III.1.C.3 is adopted from the NAMCP's recommendations.¹⁴¹ It provides for reconstruction efforts and is designed to promote funding of these efforts.

Section III.1.C.4 restates the principle that innovative ideas should be encouraged and promoted. Innovation was recognized as key by the NAMCP.¹⁴²

D. Ecotourism Monitoring.

1. **Actor Limitation.** Parties shall provide Actor Coordinators, whose job shall be to merge NGOs and to facilitate coordination of local and nonlocal Actors, including local farmers and government agencies, as well as not-for-profits. In each sanctuary, there shall be two Actor Coordinators designated. Whenever possible, Parties shall limit the number of organizations or companies that have conflicting interests with regards to an ecotourism region.
2. **Meetings.** Parties shall host a formal “Round Table” once a month during which ecotourism groups, Scientific Authorities, and Management Authorities shall discuss the successes and failures of current ecotourism programs.¹⁴³ A group of patrollers shall be designated on or before one calendar month from the date this treaty is signed. These patrollers will analyze protected areas for damage on the first day of each month. Data of environmental impact shall be submitted on a regular per-month basis to the Round Table committee.
3. **Response to Damage.** If the patrol group reports environmental damage, Parties shall halt ecotourism in the affected area. The Round Table will hold a meeting on or before seven calendar days from the date of the ecotourism shut down where Scientific Authorities, Management Authorities, and ecotourism representatives will discuss and vote on recommendations for improvement. Once the approved recommendations come into use, the committee

141. *Id.* at 38.

142. *Id.* at 40.

143. *See* Brenner & Job, *supra* note 44, at 7–10.

shall monitor progress on a weekly basis, and if there is none, the program must be halted again by the same procedure.

4. **Cost/ Benefit Analysis.** In regions where more than one ecotourism site has been closed, reopening prioritization will hinge on a cost/benefit analysis of the income derived from the region versus the cost to the environment. If the per capita income (assuming equal distribution of ecotourism in income among the local people) surrounding a particular sanctuary in Mexico is more than USD 300 greater than the per capita income of a neighboring sanctuary, the more lucrative sanctuary's ecotourism site shall be given priority for reopening.

COMMENTARY

Section III.1.D.1 recognizes that multiple actors contribute to the inadequacies of ecotourism. When actors work at cross-purposes, this is particularly detrimental to the region, and therefore this provision has been adopted to minimize damage whenever possible.

Section III.1.D.2 anticipates environmental damage and explains how exactly the Parties must respond to it. It mandates roundtable meetings and regular patrols of an at-risk region to ensure that degradation due to tourists is neither unnoticed nor repeated.

Section III.1.D.3 requires that environmental damage on ecotourism sites be halted within a very short timeframe. The section is designed with consideration of the motivations of locals and tourists, for studies have shown that 80 percent of people interviewed at ecotourism sites in Mexican butterfly sanctuaries responded that they would accept environmental protection precautions.¹⁴⁴

Section III.1.D.4 recognizes that costs are critical and emphasizes that ecotourism sites with a greater economic benefit should be prioritized. This means that if several sanctuaries are halted simultaneously, the sites that produce the highest per capita incomes will be given priority for reopening.¹⁴⁵ If two ecotourism regions were under watch, for instance, Management Authorities, Scientific

144. *Id.* at 21.

145. For instance, in 2006 it was reported that the El Rosario region produced \$400 per year in per capita income and the Cerro Prieto region produced \$1,200. *Id.*

Authorities, and ecotourism coordinators would prioritize reopening the \$1,200 ecotourism region over the \$400 one. Greater monetary yields are more likely to offset the motivations of illegal logging.

- E. Compliance.** Each Party shall monitor and respond to illegal actions in accordance with Article IV.

Article IV: Non-Compliance

- 1. Compliance Committees.** Each Party shall have a committee (“Compliance Committee”), composed of Scientific Authorities, Management Authorities, and other officials. The Compliance Committee shall be composed of two branches: a facilitative branch and an enforcement branch. The purpose of the facilitative branch is to aid countries that have difficulty complying through the creation of action plans. The enforcement committee shall impose sanctions when necessary.
- 2. Monitoring and Reporting.** Parties shall monitor progress on a monthly basis and deliver reports on compliance to the facilitative branch of the Compliance Committee on the first working day of each month. The facilitative branch, when faced with a compliance issue, shall create a plan to remedy the situation on or before 14 days from the date of reporting. A follow-up meeting on or before 30 days from the date of the plan initiation shall be held to discuss the success or failure of the current plan. The Compliance Committee will then either implement a new plan or report the problem to the enforcement committee. The decision on whether to report to the enforcement committee will be determined by a majority vote. The enforcement branch shall impose sanctions if it deems them necessary in accordance with Section 4. Data shall be reported to the other Parties on or before the 14th calendar day of each month.
- 3. Fines.** Parties who violate the Treaty shall be fined an amount proportional to the degree of environmental damage they caused. Damage shall be determined by the Compliance Committee.
 - a. Corporations.** Companies residing on the Party’s land who intrude on butterfly sanctuaries shall be fined a portion of their annual profits. The enforcement branches of Compliance Committees in each country shall initiate this process.

- b. Governments.** Governments that do not preserve land to levels approved by the CEC and by their respective environmental agencies shall pay the other signatories of the Treaty to aid in their conservation efforts and shall also allocate funds towards existing efforts in the non-complying country.
- 4. Dispute Settlement Mechanisms.** In negotiating the inclusion of a dispute settlement mechanism, Parties first must agree upon which procedure or procedures to incorporate. Their options include:
 - a.** Negotiation;
 - b.** Mediation, involving an independent third-party;
 - c.** Conciliation;
 - d.** Arbitration;
 - e.** Judicial settlement;
 - f.** Fact-finding commissions of inquiry.¹⁴⁶

Until this matter is voted on, a fact-finding commission shall be used.
- 5. Alterations.** Parties that subsequently identify compliance problems may consider developing a new compliance plan consistent with new agreements.

COMMENTARY

Section IV.1 sets forth an organizational structure that will facilitate compliance. The structure of the Compliance Committee is based on the protocol adopted in the Marrakech Accords. In the Marrakech rulebook for compliance, a facilitative and enforcement branch of the compliance committee was established,¹⁴⁷ and a similar structure is implemented here. A facilitative committee is particularly important to assist developing countries that have difficulty complying due to practical impediments. In the case of the monarch butterfly, for instance, many of the impediments to conservation in Mexico are caused by a lack of capacity rather than a lack of will. Thus, a facilitative committee can assist such countries when needed.

The enforcement branch of the committee shall play an active role in instances where facilitative efforts have failed or when there truly is a defiant political will. While many international environmental

146. U.N. ENVTL. PROGRAMME, MANUAL ON COMPLIANCE WITH AND ENFORCEMENT OF MULTILATERAL ENVIRONMENTAL AGREEMENTS 176 (2006).

147. *Id.* at 167.

treaties do not specify a compliance mechanism, such as the Kyoto Protocol and the U.N. Framework Convention on Climate Change,¹⁴⁸ the Migratory Insect Treaty specifically provides for one. The rationale is that enforcement can be particularly important when a species is at risk of extinction. In CITES, there is a mechanism of remedial action when species are traded, which proved very valuable in preserving the queen conch.¹⁴⁹ Here there will be a means of remedial action when habitat is destroyed.

Section IV.2 sets forth a time frame for the reporting procedures. Initial reports are delivered to the facilitative branch first because in the event that a Party is not acting in bad faith, the facilitative committee can aid the country without initiating penalties. Particularly in Mexico, the government has enacted protection laws, but mobs are difficult to control. In instances when facilitative aid does not remedy the situation, then the enforcement committee will take charge. In the Montreal Protocol, regular data reporting to the other Parties was a component,¹⁵⁰ and it is adopted here as well. This section anticipates that without communication, disputes are more likely, and a transparent process is ideal.

Section IV.3 discusses the kinds of fines that will be imposed in the event of noncompliance. Corporations in violation are fined by their local governments to discourage future noncompliance and to acquire funding for conservation. Government penalties, while difficult to enforce, would be beneficial particularly if the fines went towards the other Parties' conservation efforts.

Section IV.4 recognizes that disputes may occur and sets forth a series of options that Parties can choose from.¹⁵¹

Article V: Ratification, Acceptance, Approval

The present Treaty shall be subject to ratification.

Appendix 1: List of Endangered Migratory Insects Protected

148. See Kyoto Protocol to the United Nations Framework Convention on Climate Change, Feb. 16, 2005, 2303 U.N.T.S. 148; United Nations Framework Convention on Climate Change, *opened for signature* May 9, 1992, 1771 U.N.T.S. 165 (entered into force Mar. 21, 1994).

149. U.N. ENVTL. PROGRAMME, *supra* note 146, at 164.

150. See *id.* at 122.

151. *Id.* at 176.

1. Monarch Butterfly (*Danaus plexippus*).
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V. CONCLUSION

It is apparent that current laws are insufficient to protect monarch butterflies and other migratory insects, as evidenced by severely declining populations.¹⁵² The proposed treaty would help to fill this gap. Migratory birds have been protected for many years, and insects would be afforded similar protection under the Migratory Insect Treaty.

While most insects are not as beautiful as birds, insects are as essential to our livelihood as the air we breathe and the soil we walk upon; they pollinate the crops we eat, degrade the waste we discard, provide billions of dollars of ecological services every year,¹⁵³ and within them often lie the seeds of chemicals that become the next pharmaceutical drug. Already insects have been found crucial to modern medical drugs for their immunological, analgesic, antibacterial, anesthetic, and anti-rheumatic properties.¹⁵⁴ Over 500 species of insects, mites, and spiders are used as medicines to cure both common and complicated ailments.¹⁵⁵ Eight hundred species of terrestrial arthropods, the phylum that includes insects, show anticancer activity.¹⁵⁶ Promising anticancer drugs have even been isolated from the wings of Asian sulfur butterflies (*Catopsilia crocale*).¹⁵⁷

Pharmaceuticals are indeed a modern day gold mine, yet no one has left us a treasure map; we must dig in the dirt to find it ourselves. The more we study insects and the more chemicals we extract, the closer we come to filling the missing links of our own treasure map. Unlike the treasure chest, insects have an expiration date, and some of our map has already been washed away. We can but try to preserve the rest with the species that remain. The web of life is the ultimate pot of gold: the more we understand, the better prepared we

152. *Decline of Monarch Butterflies*, *supra* note 10, at 95; Lugo, *supra* note 1, at 99–100.

153. Losey & Vaughan, *supra* note 1, at 311.

154. Costa-Neto, *supra* note 119, at 36.

155. *Id.* at 35; Christopher Joyce, *Prospectors for Tropical Medicine*, 132 *NEW SCIENTIST* 36–40 (1991).

156. Costa-Neto, *supra* note 119, at 36.

157. *Id.* at 36; William E. Kunin & John H. Lawton, *Does Biodiversity Matter? Evaluating the Case for Conserving Species*, in *BIODIVERSITY: A BIOLOGY OF NUMBERS AND DIFFERENCES* 283–308 (Kevin J. Gaston ed., 1996).

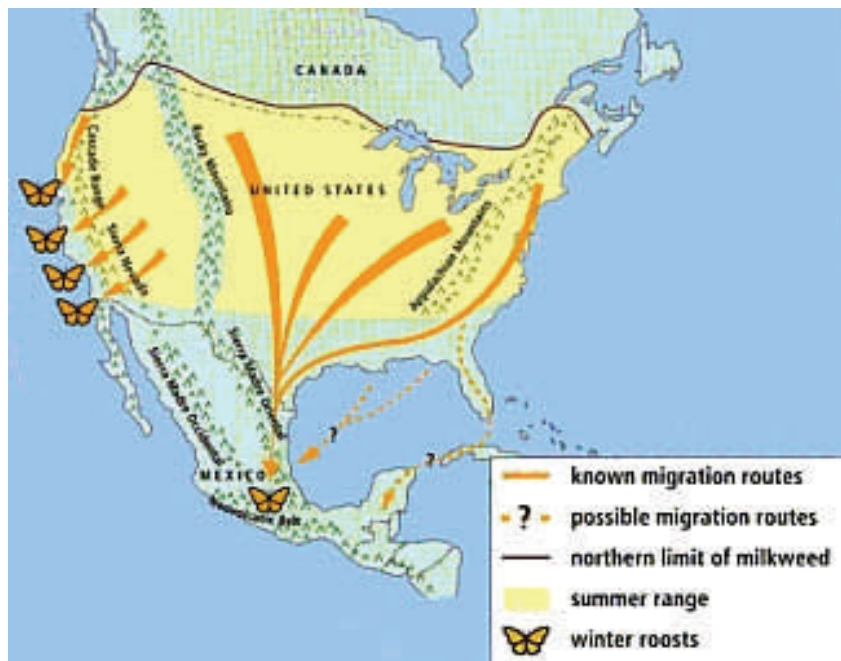
become to sustain food supplies in uncertain times and to combat diseases, old and new.

It is for these reasons that the treaty outlined in the text of this Note has been proposed. Its provisions will foster an environment conducive to long-term survival of these insects by ensuring the following: reasonable habitat throughout the flyway, preservation of plant hosts, sustainable ecotourism policies where applicable, and other ancillary measures including innovative enabling approaches such as local currencies and water credits.

Monarch butterflies are a model species for this treaty, and the agreement remains open for other migratory insect nominations. In the words of naturalist Sir David Attenborough: “If my grandchildren were to look at me and say: ‘You were aware species were disappearing and you did nothing, you said nothing,’ that I think is culpable.”¹⁵⁸

158. Sir David Attenborough was Britain’s most famous natural history filmmaker. He has worked for over fifty years as a broadcaster and naturalist, creating landmark BBC nature series. Susanna Rustin, *Attenborough Joins the Climate Change Debate*, MAIL & GUARDIAN (Oct. 28, 2011), <http://mg.co.za/article/2011-10-28-attenborough-joins-the-climate-change-debate>.

Appendix A



*Migratory Path of Monarchs in North America*¹⁵⁹

159. *Monarch Migration*, BUTTERFLY IRELAND (Aug. 2, 2014), <http://www.butterflyireland.com/news&comments.htm>.