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Moving Species and Non-Moving Reserves: Conservation Banking and the Impact of Global Climate Change

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NOTE

MOVING SPECIES AND NON-MOVING RESERVES: CONSERVATION BANKING AND THE IMPACT OF GLOBAL CLIMATE CHANGE

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INTRODUCTION

Species are on the move. A study of ninety-nine species of birds, butterflies, and alpine herbs from around the world found that on average, these various species are shifting towards the poles by 3.8 miles per decade.[1] This shift is clearly attributable to warming caused by global climate change.[2] In fact, scientists estimate that forty-one percent of all wild species have been affected in some way by recent global climate change.[3]

Moving species present a problem for non-moving preserves because the species meant to be protected may migrate out of the fixed preserve.[4] Conservation banking is a system designed to

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1. Camille Parmesan & Gary Yohe, *A Globally Coherent Fingerprint of Climate Change Impacts Across Natural Systems*, 421 NATURE 37, 38 (2003).

2. *Id.* at 41.

3. Camille Parmesan, *Biotic Response: Range and Abundance Changes, in* CLIMATE CHANGE AND BIODIVERSITY 41, 45 (Thomas E. Lovejoy & Lee Hannah eds., 2005).

4. *See* Miguel B. Araújo et al., *Would Climate Change Drive Species Out of Reserves? An Assessment of Existing Reserve-Selection Methods*, 10 GLOBAL CHANGE BIOLOGY 1618, 1623 (2004) (stating global climate change is expected to drive many species out of preserves if preserves are not designed with climate change in mind).

perpetually protect a threatened or endangered species by creating a non-moving preserve.[5] Through conservation banking, developers can compensate for developing land with a threatened or endangered species on it by buying credits in a conservation bank that has conserved land on which that species exists.[6] However, if the species migrates away from the conservation bank land due to climate change or some other ecological interaction, then developers are developing land but the species is not being protected in the long-term.[7]

This Note proposes several solutions to this problem, and argues in favor of a 'stepping-stone' approach. Under a stepping-stone approach, if a protected species goes locally extinct[8] on current conservation bank land, the conservation bank owner must purchase and protect new land containing the threatened or endangered species while maintaining the old land.[9] Besides protecting threatened or endangered species, this approach benefits conservation bank owners economically. Under such an approach, liability for purchasing new land is coupled with the ability of bankers to sell credits for additional ecosystem services that they are currently precluded from selling. Coupling liability with the ability to sell extra credits will frequently be a net economic positive for conservation bankers.

Part II of this Note reviews the law concerning conservation banking, including the requirements of the Endangered Species Act ("ESA"), and the guidance document promulgated by the United States Fish and Wildlife Service ("FWS").[10] Part II also reviews the

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5. *See* J.B. Ruhl et al., *A Practical Guide to Habitat Conservation Banking Law and Policy*, 20 NAT. RES. & ENV'T 26, 27 (2005) (describing the process of conservation bank creation).

6. *Id.* at 26.

7. *See* Araújo et al., *supra* note 4, at 1623 (stating that global climate change is expected to drive many species out of species reserves).

8. "Locally extinct" is an ecological term of art meaning that a species is extinct in the area of interest due to the death or migration of individuals of the species, but the species exists elsewhere. *See* Thomas Wolosz, *"Extinction – Definitions*, PLATTSBURGH ST. UNIV., http://faculty.plattsburgh.edu/thomas.wolosz/somedefinitions.htm (last visited Jan. 21, 2011) (defining "locally extinct" as "meaning that . . . [members of a species] are now totally absent from certain portions of what had been their nature range").

9. *See infra* Part III.C for a discussion of what maintenance of the old land would entail.

10. *See infra* Part II.A-II.D for a description of the ESA and the FWS guidance issued on conservation banking.

ecological and economic benefits of conservation banking.[11] Part II concludes by examining how ecological dynamics and global climate change may make conservation banking, as currently practiced, a poor tool for conserving threatened or endangered species;[12] and how the courts have begun to require federal agencies to consider global climate change in their decision-making.[13]

Part III discusses the strengths and weaknesses of alternative approaches FWS may consider when determining how conservation banking practices should address ecological dynamics and global climate change.[14] Part IV recommends requiring conservation bankers to purchase new lands containing the threatened or endangered species is the best legal, ecological, and economic means to protect species within the existing conservation banking framework.[15]

II. THE LAW AND ECOLOGY OF CONSERVATION BANKING

Over the past century, the extinction rate in well-documented groups of species has been 100-1000 times larger than average rates in the past.[16] Scientists estimate that this extinction rate will continue to increase in the near future by a factor of ten or more.[17] This dramatic loss of species degrades many ecosystem services, such as air and water purification, genetic resources for biochemical and pharmaceutical research, and aesthetic quality of natural lands, among many others.[18] This extremely high extinction rate is due to

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11. *See infra* Part II.E through II.F for a description of the ecological and economic benefits of conservation banking.

12. *See infra* Part II.G for a description of the ecological drawbacks of conservation banking.

13. *See infra* Part II.H for a description of court responses to global climate change.

14. *See infra* Part III.A-III.D for a description of the alternative methods of conservation banking that FWS may consider.

15. *See infra* Part IV for conclusions regarding the current practice of conservation banking in light of global climate change.

16. Robert M. May, *Ecological Science and Tomorrow's World*, 365 PHIL. TRANSACTIONS ROYAL SOC'Y B 41, 42 (2010). This rate is similar to the rates during the biggest episodes of mass extinctions in the fossil record. *Id.*

17. *Id.*

18. *Id.* at 44 (noting fifteen of twenty-four categories of ecosystem services are currently being degraded or used unsustainably).

habitat loss, overexploitation, and introduction of invasive species.[19] All three of these causes are almost exclusively the result of human activities.[20]

The ESA[21] is the primary statute by which threatened and endangered plant and animal species are protected in the United States.[22] Under the ESA, however, a developer may develop land on which a threatened or endangered species exists if the developer creates a plan to compensate for the lost habitat.[23] This compensation may take the form of conservation banking.[24]

If the species meant to be protected by the conservation bank moves out of that land, though, one must ask whether the developer has truly compensated under the ESA for the developed land. If land is taken away from a threatened or endangered species without protecting the species in some other way, then the species is more likely to go extinct, and the purpose of the ESA has been frustrated.[25] I will begin this overview with an examination of the ESA and conservation banking, and then explore how global climate change and ecological interactions may prevent the goal of conservation banking from being fulfilled. I will conclude with a brief examination of how the courts are beginning to force federal agencies to consider global climate change.

A. Endangered Species Act

The ESA defines an endangered species as "any species which is in danger of extinction throughout all or a significant portion of its

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19. *Id.* at 43.

20. *Id.*

21. Endangered Species Act, 16 U.S.C. §§ 1531-1544 (2006).

22. *See* TVA v. Hill, 437 U.S. 153, 180 (1978) ("[ESA] represented the most comprehensive legislation for the preservation of endangered species ever enacted by any nation."). The ESA, though, does not prevent all harm to threatened or endangered species. 16 U.S.C. § 1539(a)(1)(B).

23. *Id.* § 1539(a)(2)(A).

24. Ruhl et al., *supra* note 5, at 28.

25. *See* Georgina M. Mace et al., *Population and Geographic Range Dynamics: Implications for Conservation Planning*, 365 PHIL. TRANSACTIONS ROYAL SOC'Y B 3743, 3748-49 (2010) (finding that a species range and population is consistent over time except when faced with extrinsic factors, such as habitat loss which leads to a majority of range and population declines in species).

range."[26] A threatened species is "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."[27] The National Oceanic and Atmospheric Administration Fisheries Service lists endangered marine and anadromous species under the ESA, while FWS lists all other species.[28]

Section 7 of the ESA requires all federal agencies to consult with the FWS to ensure that the agency's actions do not "jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species."[29] Section 9 of the ESA prohibits the "take" of species the FWS has officially listed as endangered.[30] Similarly, a FWS regulation[31] promulgated pursuant to Section 4 of the ESA prohibits the "take" of species listed by FWS as threatened. [32] "Take" means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."[33] In an agency regulation, the FWS further defined harm to "include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering."[34] This regulation has been upheld by the U.S. Supreme Court in *Babbitt v. Sweet Home Chapter of Communities for a Great Oregon.*[35]

The FWS may allow activities that would otherwise violate the take prohibition if the take is considered "incidental."[36] If the FWS determines that a proposed action by a federal agency will not

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26. 16 U.S.C. § 1532(6).

27. *Id.* § 1532(20).

28. 50 C.F.R. § 402.01(b) (2008).

29. 16 U.S.C. § 1536(a)(2).

30. *Id.* § 1538(a)(1).

31. 50 C.F.R. § 17.31 (2005).

32. *See* 16 U.S.C. § 1533(d) (stating regulation may prohibit any act prohibited under § 1538(a) for any threatened species).

33. *Id.* § 1532(19).

34. 50 C.F.R. § 17.3 (2007).

35. 515 U.S. 687, 692-708 (1995) (holding that habitat modification that adversely impacted endangered red-cockaded woodpeckers and threatened northern spotted owls could be defined as "harm").

36. 16 U.S.C. § 1539(a)(1)(B). "Incidental take" is defined within the ESA as the taking of a listed species that is "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity." *Id.*

jeopardize the existence of a listed species but will result in incidental take, or the agency offers "reasonable and prudent alternatives" to the proposed action, then the FWS will issue an incidental take statement ("ITS") allowing the proposed federal action to go forward.[37] The ITS often requires mitigation of the proposed actions' impact on the species.[38] Projects proposed on private lands that result in an incidental take of a listed species may also be allowed under the ESA.[39] For FWS to allow the incidental take of a listed species, the landowner must first submit a habitat conservation plan ("HCP") to FWS.[40] The HCP must meet certain statutory requirements which specify the impact that the proposed taking will have on the listed species, and what steps the landowner will undertake to minimize or mitigate those impacts.[41] For actions by both federal agencies and private landowners, as a condition for a permit allowing incidental taking of a listed species, the FWS often requires habitat compensation.[42]

B. Habitat Compensation

Habitat compensation occurs when a landowner attempts to compensate for the incidental take of a listed species by conserving land where the listed species currently exists, or by restoring previously degraded land to a state where the listed species will again occur on that land.[43] Habitat compensation may take the form of conservation of a small piece of land in the vicinity where the proposed development will occur, or the developer may conserve a different piece of land separate from the proposed development.[44]

Conserving a piece of land, or restoring a previously degraded piece of land, often requires considerable biological expertise.[45]

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37. *Id.* § 1536(b)(4).

38. Ruhl et al., *supra* note 5, at 27; *cf.* 16 U.S.C. § 1536(h).

39. Ruhl et al., *supra* note 5, at 27; *cf.* 16 U.S.C. § 1539(a)(1)(B).

40. Ruhl et al., *supra* note 5, at 27; *cf.* 16 U.S.C. § 1539(a)(2)(A).

41. Ruhl et al., *supra* note 5, at 27; *cf.* 16 U.S.C. § 1539(a)(2)(A).

42. Ruhl et al., *supra* note 5, at 27 (stating habitat compensation is often one condition for FWS to give incidental take approval); *cf.* 16 U.S.C. § 1539(a)(2)(A).

43. Ruhl et al., *supra* note 5, at 27-28.

44. *Id.* at 28.

45. *See* JON A. KUSLER, ASS'N OF STATE WETLAND MANAGERS, PROTECTING AND RESTORING WETLANDS: A GUIDE FOR LAND TRUSTS 41 (2009) (stating that "project design often requires considerable expertise"); *see also* Jason Navota &

Furthermore, development often occurs across a wide area unconnected to the actions of other developers.[46] Consequently, the habitat set aside by one developer for habitat compensation is often small and not connected to other such conserved habitat.[47] As a result of these concerns, another option for developers to fulfill the requirement of habitat compensation has been created by the FWS: buying credits from a conservation bank.[48]

C. Conservation Banking

A conservation bank allows developers to compensate for incidental takings by buying credit for land that has already been conserved for the species being taken.[49] Conservation banking occurs when a landowner conserves habitat of a listed species and "markets" that habitat as "credits" to others who need to compensate for developing land where incidental taking of the listed species will occur.[50] To establish a conservation bank, the FWS requires that the conservation bank holds a conservation easement[51] so that the land will be conserved in perpetuity.[52] The conservation bank must also

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Dennis W. Dreher, *Stream, Lake, and Wetland Protection, in* PROTECTING NATURE IN YOUR COMMUNITY: A GUIDEBOOK FOR PRESERVING AND ENHANCING BIODIVERSITY 33, 38 (2000) (stating "habitat restoration projects can range from simple measures that can be readily implemented by landowners, to more extensive projects that require considerable design expertise and financial resources.").

46. *See* Ruhl et al., *supra* note 5, at 26-27(discussing the traditional practice of piecemeal on-site mitigation by individual developers).

47. *Id.*

48. *Id.* at 28.

49. *See id.* at 26 ("A conservation bank is an area of habitat that has been conserved and managed for the conservation of identified natural resource values, the benefits of which are used to offset negative impacts to the resource occurring on other areas from land use activities").

50. J.B. Ruhl, *Keeping the Endangered Species Act Relevant*, 19 DUKE ENVTL. L. & POL'Y F. 275, 291 (2009).

51. A conservation easement is a property right in land held by someone other than the landowner that imposes limitations or affirmative obligations for a conservation purpose. *See* Jessica Owley Lippmann, *The Emergence of Exacted Conservation Easements*, 84 NEB. L. REV. 1043, 1087 (2006).

52. FISH AND WILDLIFE SERV., UNITED STATES DEP'T OF THE INTERIOR, GUIDANCE FOR THE ESTABLISHMENT, USE, AND OPERATION OF CONSERVATION BANKS 17 (2003), *available at* http://www.fws.gov/endangered/esa-library/pdf/Conservation_ Banking_ Guidance.pdf.

have a management plan for the conservation of the particular listed species and enough capital in an endowment so that the management plan will be capable of being implemented to continue in perpetuity.[53]

The FWS also works with the conservation bank to set the mitigation ratio.[54] The mitigation ratio is the ratio of land conserved in the conservation bank land to the land developed.[55] For example, if a developer develops one acre of land, and must buy credit for the conservation of one acre in the conservation bank, then the mitigation ratio is 1:1.[56] If a conservation bank protects high quality habitat for the particular listed species, however, and the developer is developing land that is of lower quality, the conservation ratio may be smaller than 1:1 (e.g., a ratio of one bank acre to two developed acres).[57]

By the beginning of 2007, there were more than seventy conservation banks in the United States.[58] The banks conserve approximately 70,000 acres, and protect more than fifty listed species.[59]

D. Legal Foundation for Conservation Banking

The ESA does not specifically mention conservation banking, but FWS has interpreted sections 7 and 10 of the act to allow the creation of conservation banks.[60] The FWS set out the justifications and requirements for conservation banks in a guidance document entitled "Guidance for the Establishment, Use, and Operation of Conservation Banks" ("Guidance").[61]

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53. *Id.* at 14.

54. *Id.* at 11.

55. *Id.*

56. *Id.* Sixty-five percent of conservation banks have mitigation ratios of 1:1. *See* Ruhl et al., *supra* note 5, at 31.

57. FISH AND WILDLIFE SERV., *supra* note 52, at 11.

58. Deborah L. Mead, *History and Theory: The Origin and Evolution of Conservation Banking, in* CONSERVATION AND BIODIVERSITY BANKING: A GUIDE TO SETTING UP AND RUNNING BIODIVERSITY CREDIT TRADING SYSTEMS 9, 28 (Nathaniel Carroll, Jessica Fox, & Ricardo Bayon eds., 2008).

59. *Id.*

60. FISH AND WILDLIFE SERV., *supra* note 52, at 3-4.

61. FISH AND WILDLIFE SERV., *supra* note 52. A guidance document issued by a federal agency is not a binding regulation, and therefore does not create any

The Guidance requires that conservation banks be created through conservation easements.[62] The conservation easement holder has the right to restrict certain future activities on the land in order to protect the land's conservation values.[63] State statutes determine who may hold conservation easements, and owners are generally limited to government entities or nonprofit conservation organizations.[64] If the land is sold, the easement holder may enforce the easement against the new owner.[65] A conservation easement created by a conservation bank is thus intended to conserve the land in perpetuity.[66]

Under the doctrine of changed conditions,[67] however, a conservation easement can be terminated by a court.[68] Originally applying only to equitable servitudes and real covenants, the doctrine of changed circumstances now applies to conservation easements if conditions have changed such that the easement no longer serves its original purpose.[69] The doctrine may also apply to conservation easements created in the context of conservation banking.[70] If a conservation bank exists to protect one species, and that species goes locally extinct on bank lands, a court may then deem that the

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enforceable rights or obligations. *See* Royal C. Gardner, *Legal Considerations, in* CONSERVATION AND BIODIVERSITY BANKING: A GUIDE TO SETTING UP AND RUNNING BIODIVERSITY CREDIT TRADING SYSTEMS 69, 72 (Nathaniel Carroll, Jessica Fox, & Ricardo Bayon eds., 2008). Furthermore, a guidance document can be modified or revoked without public notice, and are not given as much deference by the courts as given to a federal regulation. *Id.*

62. FISH AND WILDLIFE SERV., *supra* note 52, at 11.

63. Gardner, *supra* note 61, at 73.

64. Lippmann, *supra* note 51, at 1087.

65. Gardner, *supra* note 61, at 75.

66. FISH AND WILDLIFE SERV., *supra* note 52, at 2.

67. Adam E. Draper, Comment, *Conservation Easements: Now More Than Ever—Overcoming Obstacles to Protect Private Lands*, 34 ENVTL. L. 247, 267 (2004) ("The doctrine of changed conditions allows the landowner to prevent enforcement of restrictions on land if the surrounding area has changed to the extent that the restrictions no longer make sense.").

68. *See id.* at 267-68 (discussing the doctrine of changed conditions with regard to conservation easements).

69. *See* C. Timothy Lindstrom, *Hicks v. Dowd: The End of Perpetuity?*, 8 WYO. L. REV. 25, 40 (2008) (illustrating through example that if a conservation easement existed for the purpose of protecting black-footed ferret habitat, the easement would be terminated if the ferret species went extinct).

70. Gardner, *supra* note 61, at 75.

conservation easement no longer has reason to exist.[71] A landowner may thus be able to convince a court to terminate a conservation easement under the doctrine of changed conditions.[72]

E. Economic and Ecological Benefits of Conservation Banks

Buying of credits at a conservation bank may be both economically and ecologically beneficial.[73] Economically, a developer can buy credits, and will not have to acquire the expertise necessary to create a management plan for habitat compensation.[74] Conversely, the conservation bank owner may take property with limited development potential and make a profit from selling credits.[75]

Conservation banking also yields ecological benefits.[76] The FWS often requires that a conservation bank be a relatively large piece of land,[77] instead of several small pieces of unconnected habitat which is likely to occur if each developer was forced to individually compensate for lost habitat.[78] Large connected habitats often allow for larger population sizes of a species, and thus a higher probability of continued viability.[79] Additionally, the conservation bank management plan is likely to be better conceived and implemented than would a plan by a developer with little or no ecological expertise.[80]

While there may be economic and ecological benefits to conservation banking, there are also potential drawbacks. These include the possibility of double dipping, unanticipated ecological interactions, and the impact of global climate change.

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71. *Id.*

72. *Id.*

73. Wayne White, *The Advantages and Opportunities, in* CONSERVATION AND BIODIVERSITY BANKING: A GUIDE TO SETTING UP AND RUNNING BIODIVERSITY CREDIT TRADING SYSTEMS 33, 36 (Nathaniel Carroll, Jessica Fox, & Ricardo Bayon eds., 2008).

74. *Id.* at 36.

75. *Id.* at 38.

76. *Id.* at 34.

77. FISH AND WILDLIFE SERV., *supra* note 52, at 6-7.

78. White, *supra* note 73, at 34.

79. *Id.; see also* FISH AND WILDLIFE SERV., *supra* note 52, at 6-7.

80. White, *supra* note 73, at 34.

F. Double Dipping

A landowner who sells conservation credits may desire to create even greater income from the property by using the land to sell credits for other natural resources, such as water quality credits, carbon credits, or credits for a different listed species inhabiting the land. Selling credits for different market-based conservation strategies on the same property is termed "stacking."[81] To properly stack credits, the credits for separate natural resource values must be derived from separate land management activities.[82] For example, a landowner could sell credits for protecting a listed species by managing the lake on the property in which the species occurs, and also sell carbon credits by managing the trees that also exist on the property. If, however, the landowner attempts to sell credits for separate natural resource values that come from the same land management activity, then the stacking has become "double-dipping."[83]

For example, double-dipping occurs when a landowner sells species-protection credits for managing the trees on the property in which a listed species lives, and also sells carbon credits for those same trees. The protection of the trees exists as part of the management plan for the listed species; thus, by selling carbon credits, the landowner is double-dipping by selling the benefit of the trees even though that benefit has already been sold.[84] Double-dipping produces extra credits for the landowner, and thus extra income, without producing any additional environmental benefit.[85]

Double-dipping is therefore the converse of "additionality," a concept used when discussing cap-and-trade programs for greenhouse gas emissions.[86] Additionality occurs when a benefit to

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81. Jessica Fox, *Getting Two for One: Opportunities and Challenges in Credit Stacking, in* CONSERVATION AND BIODIVERSITY BANKING: A GUIDE TO SETTING UP AND RUNNING BIODIVERSITY CREDIT TRADING SYSTEMS 171, 172 (Nathaniel Carroll, Jessica Fox, & Ricardo Bayon eds., 2008) [hereinafter Fox, *Getting Two for One*]; Laurie Ristino, *Conservation Easements in an Ecosystem Services Age*, 24 NAT. RES. & ENV'T 56, 57 (2010).

82. Fox, *Getting Two for One*, *supra* note 81, at 174-75.

83. *Id.* at 172.

84. *Id.* at 175.

85. *Id.*

86. *See* Ristino, *supra* note 81, at 57.

the environment would not have transpired but for a particular program (i.e., the environmental benefit would not have occurred under "business as usual").[87] Cap-and-trade programs for greenhouse gas emissions proposed by several states specifically declare that projects must meet the requirements of additionality.[88] For example, a reforestation project to capture greenhouse gas emissions that was not required by statute or court order, and not part of the common practice of an entity or occurring under a business-as-usual scenario, would likely qualify as additional.[89]

The Guidance prohibits double-dipping for other listed species, and implicitly requires additionality.[90] The Guidance states that "once a project buys a credit for one species, that credit cannot be sold again for another species."[91] The Guidance also indicates that a conservation bank may not be located on land that has previously been designated for conservation purposes.[92] Finally, the Guidance indicates that the FWS will not allow a conservation bank to be located on land where conservation values have been "permanently protected or restored under other Federal, State, Tribal, or local programs benefitting federally listed species."[93]

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87. *See id.*; James L. Olmsted, *Perpetuity, Latent Ancillary Rights, and Carbon Offsets in Global Warming Era Conservation Easements*, 39 ENVTL. L. REP. 10842, 10849 (2009).

88. *See, e.g.*, *Overview: Preliminary Draft Regulation for a California Cap-and-Trade Program*, CAL. AIR RES. BD. 1, § 96220 (2009), http://www.arb.ca.gov/cc/capandtrade/meetings/121409/pdr.pdf [hereinafter *Preliminary Draft Regulation*] (describing the requirements for offset credits, stating " . . . that GHG emission reductions or avoidances, or GHG sequestration that result from an offset project must be real, additional, quantifiable, permanent, verifiable, and enforceable"); *Regional Greenhouse Gas Initiative Model Rule*, REG'L GREENHOUSE GAS INITIATIVE 1, Subpart XX-10.3(d) (2008), http://www.rggi.org/docs/Model%20Rule%20Revised%2012.31.08.pdf (listing four requirements for greenhouse gas emission offset project to be considered additional).

89. *See Preliminary Draft Regulation*, *supra* note 88, at § 96240(c).

90. *See* FISH AND WILDLIFE SERV., *supra* note 52, at 9; *see also* Ristino, *supra* note 81, at 57.

91. FISH AND WILDLIFE SERV., *supra* note 52, at 9.

92. *Id.* at 6.

93. *Id.*

G. Ecological Concerns

1. Alternative Stable States

Conservation banking is based on an assumption of fungibility—the notion that for any parcel of developed land, a corresponding parcel can be found or created in a conservation bank that is of equivalent ecological value for the protected species.[94] The mitigation ratio set by the FWS may take into account slight differences in the ecological quality of the land being banked versus the land being developed.[95] The mitigation ratio cannot, however, prevent protected land from entering into an alternative stable state.[96] An alternative stable state occurs when external factors push an ecosystem past an ecological threshold, and the land enters a new state from which reversion is impossible.[97] If conservation bank land crosses such a threshold, thereby entering into an alternative stable state of lower ecological quality, it may be impossible to restore the land to its previous ecological quality.[98] Should this occur, no mitigation ratio may be appropriate because the conservation bank land will never again be of equivalent ecological quality with the previously undeveloped land.[99]

2. Sources, Sinks, and Metapopulations

The assumption of fungibility also does not consider ecological interactions occurring among populations of the listed species, such

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94. James Salzman & J.B. Ruhl, *Currencies and the Commodification of Environmental Law*, 53 STAN. L. REV. 607, 611 (2000).

95. *See* FISH AND WILDLIFE SERV., *supra* note 52, at 11.

96. *See* U.S. CLIMATE CHANGE SCI. PROGRAM, THRESHOLDS OF CHANGE IN ECOSYSTEMS, SYNTHESIS AND ASSESSMENT PRODUCT 4.2 viii (2009) ("Ecological thresholds occur when external factors, positive feedbacks, or nonlinear instabilities in a system cause changes to propagate in a domino-like fashion that is potentially irreversible. Once an ecological threshold is crossed, the ecosystem in question is not likely to return to its previous state.").

97. *Id.* at 20, 24, 88.

98. *See id.* at 1.

99. *See* Douglas J. Bruggeman et al., *Relating Tradable Credits for Biodiversity to Sustainability Criteria in a Dynamic Landscape*, 24 LANDSCAPE ECOLOGY 775, 776 (2009) (stating that traded habitat patches must make equivalent contributions to recruitment and migration to prevent trade from reducing population viability at landscape level).

as source-sink dynamics and metapopulation structure.[100] The population of a listed species occurring in the land protected by the conservation bank may be quite large.[101] This might lead to a belief that the population is healthy and is likely to remain viable for a long period of time.[102] There are many examples in the scientific literature, however, of large populations that are really only sinks for distinct source populations.[103] A source population generally exists in high quality habitat and produces many emigrants from the population, while a sink population generally exists in low quality habitat and relies on immigrants from a source population in order to keep from going extinct.[104] More technically, a source population has a discrete population growth rate that is greater than one, and produces a net flow of emigrants out of the population to other populations of the species.[105] A sink population, conversely, has a discrete population growth rate that is less than one, and must receive a steady-stream of immigrants from a source population, or the sink population goes locally extinct.[106] Consequently, the possibility exists that a population protected in a conservation bank is actually a sink population that only exists because it is receiving immigrants from a nearby source population.[107] If the source population is lost due to development (perhaps even allowed to be lost through credits bought

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100. *See id.* at 776, 788 (stating that trading habitats does not take into account metapopulation dynamics or source-sink dynamics).

101. *See* Jessica Fox & Anamaria Nino-Murcia, *Status of Species Conservation Banking in the United States*, 19 CONSERVATION BIOLOGY 996, 999 (2005) (finding ninety-four percent of thirty-two reporting conservation banks, ranging in size from 25.3 to 10,400 acres, are based on preserved habitat, implying they contain a significant population of the protected species).

102. *See* Bruggeman et al., *supra* note 99, at 776 (stating that even if traded habitat patches have equal abundance of species, populations inhabiting these patches may differ in recruitment or survival).

103. *See generally*, David R. Breininger & Donna M. Oddy, *Do Habitat Potential, Population Density, and Fires Influence Scrub-Jay Source-Sink Dynamics*, 14 ECOLOGICAL APPLICATIONS 1079 (2004); Derek Marley Johnson, *Source-Sink Dynamics in a Temporally Heterogeneous Environment*, 85 ECOLOGY 2037 (2004).

104. Tristan Kimbrell & Robert D. Holt, *Canalization Breakdown and Evolution in a Source-Sink System*, 169 AM. NATURALIST 370, 370 (2007).

105. *Id.*

106. *Id.*

107. *See id.*

at the conservation bank), the sink population will inevitably go extinct.[108]

A similar problem arises if the population of the listed species protected in the conservation bank is part of a larger metapopulation.[109] Many different species have been found to have a metapopulation structure.[110] A metapopulation consists of several discrete populations that may do well in some years, acting as sources that produce emigrants to other populations, but through chance, one or several of the populations in the metapopulation may go locally extinct in another year.[111] If other populations of the metapopulation still exist in the landscape, those other populations may produce emigrants that will find their way to the habitat where the focal population used to exist, and then recolonize that habitat.[112] Thus, in any given year, any population in the metapopulation may go locally extinct and then later be recolonized by a different population that did not go extinct.[113]

If a conservation bank protects a population that is part of a larger metapopulation, the population in the protected land may naturally go locally extinct on a regular basis.[114] If other populations exist nearby, then the population occurring on the protected land will be recolonized.[115] If, however, the other populations have been lost due to development, then when the population occurring on the protected

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108. *See id.*

109. *See* Bruggeman et al., *supra* note 99, at 776 (stating trading habitats may influence other patches in landscape through metapopulation dynamics).

110. *See, e.g.*, ILKKA HANSKI, METAPOPULATION ECOLOGY 199 (Oxford Univ. 1999) (describing metapopulation dynamics of an endangered passerine, the Bachman's sparrow).

111. *Id.* at 15.

112. *Id.* at 15-16 (stating that "the necessary condition for metapopulation survival is that a single local population in a network of empty patches causes the colonization of at least one new patch during its lifetime.").

113. *See id.* at 15.

114. *Id.* at 15-16 (noting that metapopulations serve as a corollary for conservationists, and applying the necessary condition for metapopulation survival in a network of empty patches, fosters the conclusion that local populations may go naturally extinct but would be repopulated from neighboring patches).

115. *Id.*

land goes locally extinct, it will not be recolonized, and that population will be permanently lost.[116]

Source-sink dynamics and metapopulation structure are likely to frequently influence the existence of listed species in conservation banks.[117] Conservation banking agreements, however, do not explicitly consider the possibility that these types of ecological dynamics will affect the species on the bank land.[118] Conservation banking agreements also do not take into account the greatest ecological pressure facing many threatened and endangered species: changes in ecological interactions due to global climate change.[119]

3. Global Climate Change

The Intergovernmental Panel on Climate Change ("IPCC") reports that over the fifty year period from 1956 to 2005, the global average temperature has increased approximately 0.13° C per decade.[120] Such dramatic climate change led the IPCC to conclude that "[t]here is *very high confidence* . . . that recent warming is strongly affecting terrestrial biological systems."[121] Climate change will continue to greatly affect biological systems as warming is projected to increase 0.2° C per decade for the next two decades.[122] Under various modeling scenarios, the global average temperature is projected to increase by 1.8 to 4.0° C by the end of the century.[123] With warming exceeding 1.5 to 2.5° C, "there are projected to be major changes in ecosystem structure and function, species' ecological interactions and shifts in species' geographical ranges."[124]

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116. *See id.* at 183 (stating that habitat destruction may increase fragmentation of remaining habitat which has further consequences beyond the habitat destroyed).

117. *See* Bruggeman et al., *supra* note 99, at 788.

118. *Id.* (recommending conservation banking agreements consider natural history and population dynamics).

119. See *infra* Part II.G.3 for a discussion of global climate change.

120. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: SYNTHESIS REPORT 30 (2007), *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/ syr/ar4_syr.pdf.

121. *Id.* at 33 (emphasis in original).

122. *Id.* at 33, 45.

123. *Id.*

124. *Id.* at 48.

Global climate change threatens many ecosystems in the United States.[125] The ecological outcomes of such widespread change will be highly nonlinear and thus difficult to predict, but will likely alter the habitat ranges of many species.[126] For example, the American Southwest is projected to transition to a more arid climate, similar to that of the Dust Bowl of the 1930s, within a time frame of years to decades.[127] Such a transition will have widespread impacts on the American Southwest ecosystems, and the geographic ranges of species that reside there.[128] Thus, climate change may influence abiotic factors, such as aridity, to such an extent that many listed species' geographic ranges will change dramatically.[129]

Climate change is also likely to increase the ranges of many invasive species.[130] As invasive species spread, they will often outcompete and displace native threatened or endangered species.[131] As a consequence, the changes in the geographic ranges of invasive species may ultimately alter the ranges of many listed species.[132] The Guidance calls for conservation bank management plans that control the spread of any invasive species on the bank land.[133] However, once an invasive species has entered an ecosystem, attempting to

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125. *See* Douglas Fox, *Back to the No-Analog Future?*, 316 SCI. 823, 823 (2007) [hereinafter Fox, *No-Analog Future*] ("If the climate changes over the next 100 years as current models predict, surviving species throughout much of Earth's land area will not simply migrate north and south en masse as unchanging communities . . . [i]nstead, they are likely to be reshuffled into novel ecosystems unknown today.")

126. *Id.*

127. Richard Seager et al., *Model Projections of an Imminent Transition to a More Arid Climate in Southwestern North America*, 316 SCI. 1181, 1181 (2007).

128. *See* Susan Schwinning et al., *Sensitivity of the Colorado Plateau to Change: Climate, Ecosystems, and Society*, 13 ECOLOGY & SOC'Y 28, 42 (2008) (predicting change to the ecosystems of the Colorado Plateau due to soil erosion, droughts, and desertification caused by climate change).

129. *Id.*

130. Jessica J. Hellmann et al., *Five Potential Consequences of Climate Change for Invasive Species*, 22 CONSERV. BIOLOGY 534, 539 (2008).

131. *Id.*

132. *See* Lee Hannah & Lara Hansen, *Designing Landscapes and Seascapes for Change*, *in* CLIMATE CHANGE AND BIODIVERSITY 329, 332 (Thomas E. Lovejoy & Lee Hannah eds., 2005) (stating climate change, habitat loss, and invasive species may act synergistically, resulting in greater changes to species spatial distributions than if each were acting alone).

133. FISH AND WILDLIFE SERV., *supra* note 52, at 6.

remove the species may be extremely difficult, or may even result in unintended consequences such as the proliferation of other exotic species that are an even greater menace to the threatened or endangered species.[134]

Additionally, climate change may increase the likelihood that alternative stable states will be reached, or that source-sink and metapopulation dynamics will lead to local extinction.[135] Global climate change is predicted to destabilize the interactions among species in many ecological communities.[136] Such destabilization is one factor that may push an ecosystem past a threshold and to an alternative stable state of lower ecological quality.[137] Such destabilization also increases the likelihood that ecological interactions such as source-sink and metapopulation dynamics will become less stable. This greater destabilization may thereby lead to a greater likelihood of local extinction.

As the potential for destabilization by source-sink and metapopulation dynamics demonstrates, climate change will not simply shorten a species' range at the southernmost region of that range. The biotic interactions of a listed species with other species help determine the listed species' geographic range.[138] Thus, even if climate change does not affect a listed species directly through abiotic factors, its effect on other species within the ecosystem may determine where the listed species can occur.[139] As a result, global climate change has the potential to alter the current geographical ranges of many listed species throughout their entire historical ranges.[140]

As the effects of global climate change and ecological interactions are likely to be pervasive, many potential conservation banks may be impacted. Consequently, land banked today to conserve individuals

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134. Paul W. Collins et al., *Does the Order of Invasive Species Removal Matter? The Case of the Eagle and the Pig*, 4 PLOS ONE 1, 1 (2009).

135. *See* U.S. CLIMATE CHANGE SCI. PROGRAM, *supra* note 96, at 18 (discussing the potential for alternative stable states due to global climate change).

136. *Id.*

137. *Id.*

138. Kristine L. Preston et al., *Habitat Shifts of Endangered Species Under Altered Climate Conditions: Importance of Biotic Interactions*, 14 GLOBAL CHANGE BIOLOGY 2501, 2513 (2008).

139. *See id.*

140. *Id.*

of a listed species may very well contain no individuals of that species tomorrow.

H. Response by the Courts to Climate Change

Courts have begun to task the federal executive branch with incorporating global climate change considerations into decision-making processes. In *Massachusetts v. EPA*[141] the U.S. Supreme Court held that the Clean Air Act authorizes the EPA to regulate greenhouse gas emissions from automobiles.[142] It also held that the EPA must regulate those greenhouse gas emissions unless it either determines that emissions do not contribute to global warming, or provides a reasonable explanation for why it will not regulate the emissions.[143] Following this decision, a district court in *Natural Resources Defense Council v. Kempthorne*[144] held that the FWS acted arbitrarily and capriciously by failing to consider the issue of climate change in a biological opinion it wrote in consultation with a different executive branch agency.[145]

If courts continue to require the FWS to consider climate change when making decisions, then a court may eventually require the FWS to consider climate change in deciding whether to allow mitigation of the incidental taking of listed species through conservation banking. The primary means by which global climate change would impact conservation banking is through the protected species in the conservation bank going locally extinct on the conservation bank lands.[146] As discussed in the previous section,[147] this could occur through the range of the species shifting with climate change,[148] or with climate change enhancing the destabilizing influences of ecological interactions such as source-sink or metapopulation dynamics.[149] As a result, if FWS is forced to consider how climate

141. 549 U.S. 497 (2007).

142. *Id.* at 533-34.

143. *Id.*

144. 506 F. Supp. 2d 322 (E.D. Cal. 2007).

145. *Id.* at 387-88.

146. Araújo et al., *supra* note 4, at 1623.

147. *See supra* Part II.G for a discussion of the potential impacts of global climate change on threatened and endangered species.

148. Araújo et al., *supra* note 4, at 1623.

149. *See* Preston et al., *supra* note 138, at 2513 (noting a species' habitat may be affected by climate change through the biotic interactions on which it relies).

change will impact conservation banking, it will also be forced to consider how moving species will impact the current structure of conservation banking.

III. APPROACHES TO PROTECTING SPECIES IN PERPETUITY

Global climate change could potentially impact conservation banking by resulting in protected species going locally extinct on bank lands.[150] Conservation banks exist to fulfill the ESA's requirement that taking of a threatened or endangered species be mitigated.[151] If a listed species goes extinct on bank land, then the conservation bank ceases to mitigate the taking. FWS has stated that it understands the importance of climate change on ecosystems, and it has indicated that it will take climate change into account with regard to future planning.[152] FWS should consider how global climate change impacts conservation banking agreements. If FWS does not undertake such a review on its own accord, the courts will likely force FWS to consider the impact of global climate change on conservation banking.[153]

Regardless of why it initiates a review, FWS will likely have considerable leeway in determining how climate change considerations should impact conservation banking agreements.[154] I

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150. *See supra* Part II.G for a discussion of the ways climate change will likely impact listed species on conservation bank land.

151. FISH AND WILDLIFE SERV., *supra* note 52, at 3-4.

152. *See* FISH & WILDLIFE SERV., UNITED STATES DEP'T OF THE INTERIOR, RISING TO THE CHALLENGE: STRATEGIC PLAN FOR RESPONDING TO ACCELERATING CLIMATE CHANGE (REVISED DRAFT) 9 (2009), http://www.fws.gov/home/climatechange/pdf/CCDraftStratPlan92209.pdf; FISH & WILDLIFE SERV., UNITED STATES DEP'T OF THE INTERIOR, APPENDIX: 5-YEAR ACTION PLAN FOR IMPLEMENTING THE CLIMATE CHANGE STRATEGIC PLAN (REVISED DRAFT) 4-6 (2009), http://www.fws.gov/home/climatechange/pdf/CCDraftActionPlan92209.pdf.

153. J.B. Ruhl, *Climate Change and the Endangered Species Act: Building Bridges to the No-Analog Future*, 88 B.U. L. REV. 1, 46 (2008).

154. *See id.* (stating once FWS has evaluated climate change in consultation with another agency, FWS has considerable latitude in evaluating the indirect and cumulative effects of climate change); *see also* Chevron U.S.A. v. Natural. Res. Def. Council, 467 U.S. 837, 844 (1984) (holding if delegation by congress to federal agency is implicit, court may not substitute its interpretation of statute for reasonable interpretation made by agency).

examine three approaches that FWS may consider for confronting the possibility of a listed species going locally extinct in a conservation bank set up to protect that species: (1) maintain the current conservation banking scheme as it already exists;[155] (2) allow credits to be sold for species where the listed species does not now exist, but may exist in the future;[156] or (3) hold the conservation bank owner liable when a species goes locally extinct on bank land, so that the bank owner must either purchase new land where the species now exists, or purchase credits for that species in a different conservation bank.[157]

After examining the potential strengths and weaknesses of each of these approaches, I argue that the third approach would be the best option for the listed species ecologically, and potentially the most favorable to bank owners economically.[158] The third approach is thus the most desirable solution for FWS to adopt in order to respond to the impact of global climate change on conservation banking.

A. Status Quo Approach

Under the status quo approach, FWS maintains the current conservation banking scheme, such that if protected species go locally extinct on conservation bank lands, the parties bear no further liability to continue protecting the species.[159]

1. Strengths of Status Quo Approach

The greatest strength of this approach is that it is already in place and is the one best understood by FWS and the parties creating and

155. *See infra* Part III.A for an analysis of the status quo approach.

156. *See infra* Part III.B for an analysis of the future habitat approach.

157. *See infra* Part III.C for an analysis of the stepping stone approach.

158. *See infra* Part III.D for a weighing of the different approaches.

159. *See* CONSERVATION AND BIODIVERSITY BANKING: A GUIDE TO SETTING UP AND RUNNING BIODIVERSITY CREDIT TRADING SYSTEMS 274-75 app. (Nathaniel Carroll, Jessica Fox, & Ricardo Bayon eds., 2008) (providing a sample conservation bank agreement contract, showing there is no mention of species going locally extinct or liability for a bank owner to continue protecting species after going locally extinct on conservation bank land, and recognition that if conservation easement is impossible to accomplish, a court can terminate or extinguish easement).

maintaining conservation banks.[160] This scheme is also the simplest means of implementing a conservation bank: credits are sold for listed species that currently exist on land owned by a conservation bank, and if the species goes extinct on that land there is no further liability for protection of the species.[161]

The second strength of this scheme is that it disregards whether the protected species would have also gone locally extinct on the developed land if it had not been developed. If the listed species goes locally extinct on the conservation bank lands, it is possible the species would have also gone extinct on the land allowed to be developed, even if the land had never been developed. If the species would have gone extinct on the land to be developed, whether - developed or not, a developer could argue there should be no requirement to mitigate any incidental taking of the species under the ESA, as it was not the action of the developer that actually jeopardized the continued existence of the listed species.[162] Therefore, when the listed species goes extinct on the conservation bank land, there should be no further requirement of the bank owner to protect the listed species.

The final strength is that if the FWS believes that there exists a possibility that a protected species will eventually go locally extinct in a given conservation bank, the agency can take that into account by altering the mitigation ratio approved for the bank.[163] For example, the FWS could require a developer to buy credits for two acres of conservation bank land for every acre developed even though the developed and conservation bank land are comparable in ecological quality.[164] As a result, the uncertainty surrounding whether the protected species will go locally extinct in the conservation bank in the future could be reflected in the current mitigation ratio.

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160. *See* Mead, *supra* note 58, at 28 (stating as of 2007 there were approximately seventy conservation banks in operation in the United States).

161. *See* FISH AND WILDLIFE SERV., *supra* note 52 (providing no indication of liability if listed species goes extinct on conservation bank land).

162. *See* 16 U.S.C. § 1536(a)(2) (2006) (requiring that federal agency actions not jeopardize the continued existence of any threatened or endangered species).

163. *See* FISH AND WILDLIFE SERV., *supra* note 52, at 11 (noting FWS may alter mitigation ratios based on sound biological rationales).

164. *Id.*

2. Weaknesses of Status Quo Approach

If the protected species goes extinct on banked lands, then mitigation for the taking on the developed land has failed. The ESA clearly requires mitigation of any taking of a threatened or endangered species.[165] If a species goes locally extinct on the conservation bank land, the species is no longer being protected by the bank. Conversely, it is unknown whether the listed species would have gone extinct on the developed land if the land had not been developed in the first place. Thus there is a discrepancy between the eventual local extinction of the species on the conservation bank land, and the inability to know whether the species would have gone extinct on the developed land had it not been developed. Furthermore, the conservation bank likely acted to mitigate the taking of the listed species for several different development projects on many different parcels of land.[166] As these developed parcels were potentially spread over a relatively wide area, it is likely that the listed species would not have gone extinct on every single parcel of developed land if each parcel had not been developed.[167] Consequently, the discrepancy between the certainty that the species went extinct on the conservation bank lands versus the uncertainty that the species would have gone extinct on the developed land suggests that the bank owner should maintain continued liability for protecting the species after it has gone locally extinct on the bank land. Otherwise, the development of land that resulted in the loss of habitat for the listed species was not mitigated, as required by the Guidance.[168]

A counter-argument to this potential weakness is that when averaging over many conservation banks protecting many different species, on some occasions listed species will go locally extinct in the conservation bank when the species would not have gone locally

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165. 16 U.S.C. §§ 1536(h), 1539(a)(2)(A).

166. *See* FISH AND WILDLIFE SERV., *supra* note 52, at 2 (stating bank parcels are usually large enough to accommodate mitigation of several development projects).

167. *See* Bruggeman et al., *supra* note 99, at 776 (finding rates of local extinction within landscape may change for habitat patches that were not even involved in trading).

168. *See* FISH AND WILDLIFE SERV., *supra* note 52, at 2 (stating conservation banks "offset impacts occurring elsewhere to the same resource values on non-bank lands").

extinct on the developed land if it had not been developed.[169] However, there will also be many occasions in which the listed species will not go locally extinct on the conservation bank land when the species would have gone locally extinct on the developed land even if the land had not been developed.[170] Additionally, because conservation banks are often relatively large contiguous parcels of land that contain habitats of higher quality for the listed species than the land that was developed, the occasions when the listed species remains extant on the conservation bank lands when it would have gone locally extinct on the developed lands even if not developed will probably occur more often than the opposite scenario.[171] Thus, by averaging over all of the conservation banks in the United States, the current banking scheme mitigates against the loss of listed species habitat, and thus individual bank owners should not be liable for protecting a species if it happens to go locally extinct on the bank land that he or she owns.

This counter-argument fails, however, when considering the language of the ESA. Mitigation by conservation banks may average out, but it averages out over many different listed species. The ESA requires protecting every listed species, and mitigating the taking of every listed species.[172] The ESA does not contain a provision allowing some listed species to be harmed as long as other listed species are benefited.[173] Thus, averaging over many different species is not allowed, and each individual listed species must be considered separately when determining the liability of a bank owner to continue protecting a species.[174]

Similarly, manipulating the mitigation ratio for the conservation bank also fails when considering the requirements of the ESA. The

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169. *See, e.g.,* Araújo et al., *supra* note 4, at 1623 (stating species are likely to be forced out of reserves by climate change).

170. *See* Parmesan, *supra* note 3, at 45 (stating global climate change has affected many species' ranges and distributions, causing species to go locally extinct with or without development).

171. *See* White, *supra* note 73, at 34 (stating large connected habitats in many conservation banks produce a higher probability of continued viability of listed species).

172. *See* 16 U.S.C. § 1538(a)(1) (2006) (stating it is unlawful to take "any endangered species of fish or wildlife").

173. *Id.*

174. *Id.* (prohibiting the taking and other unlawful behavior with respect to individual species, not overall environmental impact).

ESA requires mitigation of any taking of a threatened or endangered species.[175] If a developer buys credits in a conservation bank to mitigate an incidental taking, but the species goes locally extinct on the conservation bank land, then no mitigation has actually occurred. No manipulation of the mitigation ratios overcomes this fact.

A second weakness with the status quo approach is that if a listed species does go locally extinct on bank lands, the species suffers a net loss of its habitat.[176] The rationale for conservation banking is that the taking of a listed species through development will be offset by protecting individuals of that species in a different location in perpetuity.[177] If the conservation bank is not protecting the species' habitat in perpetuity then the scheme is not fulfilling the purpose it was designed to accomplish.[178]

Furthermore, if the listed species goes locally extinct on the conservation bank land, then the protection of the species on bank land required by the conservation easement is impossible to accomplish and may potentially be terminated by a court.[179] As a result, the bank land, while no longer supporting the listed species but still potentially ecologically important to the region,[180] may also be lost to development. By not holding bank owners liable for protecting listed species after they go extinct on bank lands, there is not only a net loss of habitat for the listed species, but also a net loss of potentially valuable ecological habitat. As a consequence, if the FWS is forced to consider how climate change impacts conservation banking, the agency should determine that the status quo approach does not fulfill its purpose under the ESA.

B. Future Habitat Approach

If a listed species will not exist in the future on an area proposed as a conservation bank, then perhaps the land for

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175. 16 U.S.C. §§ 1536(h), 1539(a)(2)(A).

176. *See* Ruhl et al., *supra* note 5, at 26 (explaining conservation banks offset negative impacts to listed species on developed land).

177. FISH AND WILDLIFE SERV., *supra* note 52, at 2.

178. *Id.*

179. *See* Gardner, *supra* note 61, at 75 (stating changing conditions may lead courts to terminate conservation agreements).

180. *See* White, *supra* note 73, at 34 (stating conservation banks are often of relatively large size and thus of greater ecological quality).

conservation banks should be placed where the listed species will likely be in the future. The site chosen for a conservation bank could be placed within the habitat range where the species would likely exist in the future.[181] Ecological models could be created to predict where a listed species would likely exist over a time horizon which would encompass the largest effects of climate change.[182] Such a model would use the current habitat needs of the species, along with predicted changes in the range distributions of other species, to predict where the listed species would occur geographically.[183] If the listed species is predicted to inhabit land in the future where the species currently exists, then a conservation bank would be placed there as under the current banking scheme. If, however, the listed species is predicted to inhabit land where it does not currently exist, then a conservation bank would be placed on land where the species does not yet exist. Credits for current development projects would be sold for the conservation bank, and mitigation would actually occur in the future when the listed species arrived on the bank lands.

1. Strengths of Future Habitat Approach

The primary strength of this approach is that by first determining where a listed species is likely to exist geographically in the future, there is a smaller likelihood that the species will go locally extinct on the conservation bank lands.[184] Thus, there may be a greater likelihood that the species will truly be protected in perpetuity on the bank lands.

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181. *See* Lee Hannah, *Protected Areas and Climate Change*, 1134 ANN. N.Y. ACAD. SCI. 201, 208-09 (2008) (arguing shifting species ranges due to climate change require shifting protected areas). *But see infra* notes 187-89 and accompanying text (discussing that predicting where species will be in the future is often extremely difficult).

182. *See* Ruhl, *supra* note 153, at 21 ("The [US]FWS, in other words, has to find models that predict the effects of global climate warming on a wide range of physical and biological cycles, 'downscale' those effects to local ecological conditions, and then evaluate the effects of those local changes on the species of concern").

183. *Id.*

184. *See* Bronwyn Rayfield et al., *Comparing Static Versus Dynamic Protected Areas in the Québec Boreal Forest*, 141 BIOLOGICAL CONSERV. 438, 446 (2008) (using simulation model to find American marten population would be better protected by dynamic protected areas than static protected areas).

A second strength of this approach is that it is conceptually similar to a conservation bank being opened on land requiring restoration.[185] Currently, potential bank owners are allowed to open a bank on land that requires restoration before individuals of the listed species exist on the land.[186] Opening a bank on land where the species may not exist for several years (or decades) can be thought of as analogous to a temporal restoration.

2. Weaknesses of Future Habitat Approach

The first weakness of this approach is that ecological models may not be able to accurately predict where a listed species will occur in the future to make this approach feasible.[187] Climate change will have many unforeseen consequences, and an ecological model may not be capable of predicting all of these consequences.[188] Furthermore, an ecological model may not be able to adequately consider how anthropogenic change (such as development of surrounding land, or attempts to reduce the emission of carbon dioxide and thus alter the course of climate change) will alter the potential future area of inhabitation of a listed species.[189] Finally, creating such an ecological model would be expensive and time consuming for the potential conservation bank owner, and cutting corners would likely lead to incorrect predictions.[190] As a result, credits sold from a conservation bank where the listed species does not yet exist may be credits for a species that may never exist on the bank land. If the species never arrives at the conservation bank lands, there will have been no mitigation for the taking of the species.

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185. *See* FISH AND WILDLIFE SERV., *supra* note 52, at 2 (listing restored habitats as possible locations for conservation bank).

186. *Id.* at 7.

187. *See* Ruhl, *supra* note 153, at 23 (stating accurate predictions of global climate change effects on local ecological conditions is beyond the capacity of current ecological models).

188. *See id.* at 21 ("[S]pecific downscaling efforts encounter the same nonlinear feedback properties that make climate change effects difficult to model and predict at mean global levels, but they operate with even more volatility at regional and local levels.").

189. *Id.*

190. FWS does not even require potential conservation bank owners to perform a population viability analysis before selling mitigation credits as it is considered too onerous. FISH AND WILDLIFE SERV., *supra* note 52, at 10.

The second weakness is that the analogy to a conservation bank selling credits for restored land quickly breaks down. The Guidance notes that if a bank restores land, credits should not be sold until the listed species actually exists on the restored land.[191] Furthermore, the Guidance appears to require that the taking of a listed species through development of land be mitigated in the present.[192] A conservation bank owner under the status quo approach is not allowed to sell credits and promise mitigation in the future.[193] Similarly, the FWS should be reluctant to allow a conservation bank owner to sell credits for future mitigation, especially if that mitigation may never materialize due to the listed species never arriving on the conservation bank lands.

C. Stepping Stone Approach[194]

Under the final approach, if a listed species goes locally extinct in a conservation bank, the conservation bank owner must buy land where the species currently exists and must either create a conservation easement for those new lands, or buy credits for that species in another conservation bank where the species currently exists. This requirement would be incorporated into the agreement between the owner and FWS. The funds to buy the new land or credits would come from either terminating the conservation easement and selling the current conservation bank land, or from money retained from the original sale of the conservation bank credits.

An "ark" easement is a conservation easement that can be easily terminated if its purpose fails because of changing environmental

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191. *See id.* at 7-8 (stating some method is needed to ensure protected species arrives in restored habitat, such as allowing credit to be sold only upon completion of restoration).

192. *See id.* at 10 ("At the time that the first credit in a bank or phase of a bank is sold, the land within the bank or its phase must be permanently protected through fee title or a conservation easement, with any land use restrictions set in perpetuity for the land legally established.").

193. *Id.*

194. This approach is so named because as one walks down a stone path, the stepping stones provide support in turn, but are left behind as one continues down the path.

conditions.[195] The proceeds from the sale of the underlying land can then be used to purchase new ecologically important land.[196] Creating a conservation bank using an ark easement allows the conservation banker to easily terminate the conservation easement on the land if the protected species goes locally extinct, and then use the money from the sale of the land to buy new land or credits.[197] Ark easements, however, have only been proposed in the legal literature and do not yet appear to have been used in actual conservation easement agreements.[198]

Furthermore, as explained below, a stepping stone approach would make it difficult in most instances to terminate the conservation easement because the conservation bank land would still be in use for conservation purposes. As a consequence, ark easements will not be further considered in this Note. Throughout the rest of this Note, it is assumed that when the protected species goes locally extinct, the conservation bank owner does not sell the bank land, but instead purchases new land or credits with other funds.

To prepare for the possibility of having to purchase new land or credits, the conservation bank owner will likely need to self-insure.[199] Funds would presumably come from selling bank credits at a higher price than under the status quo approach, or from selling credits for other natural resource values as discussed below.[200]

If the bank owner does not want to self-insure, he or she may choose to purchase an insurance policy.[201] The premiums for the

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195. James L. Olmsted, *Climate Surfing: A Conceptual Guide to Drafting Conservation Easements in the Age of Global Warming*, 23 ST. JOHN'S J. LEGAL COMMENT. 765, 802-03 (2008).

196. *Id.*

197. *Id.*

198. *See id.* at 802-06 (discussing the potential advantages of and issues identified in the existing literature for a land trust implementing an ark conservation easement model).

199. Barton H. Thompson, Jr., *Ecosystem Services & Natural Capital: Reconceiving Environmental Management*, 17 N.Y.U. ENVTL. L.J. 460, 483 (2008) (discussing the ability of and need for the law to make mechanisms such as insurance possible).

200. *See infra* Part III.C.1 for a discussion of credit stacking other natural resource values.

201. *See* Thompson, *supra* note 199, at 483 (stating law can provide assurances of ecosystem services investment security through creation of insurance and other security mechanisms).

insurance policy would likely be paid from monthly interest from the endowment created at the time of the conservation easement agreement for the implementation of the management plan.[202] Thus, the endowment created under the stepping stone approach must be larger than under the other approaches so that the insurance premiums could be paid from the interest earned on the endowment.[203] If the protected species goes extinct and new land or credits must be purchased, the management plan's endowment would no longer be used for management of the species on the conservation bank lands.[204] Therefore, the endowment's money would also be used in purchasing new lands or credits. Consequently, the endowment would be used to help offset the cost of buying new land or credits.

1. Strengths of the Stepping Stone Approach

The greatest strength of this approach is that the listed species would be protected on land designated as a conservation easement for longer than under the other two approaches. If, when the species goes locally extinct the conservation bank owner buys credits in a different conservation bank, and that bank is also liable for buying credits in a different bank if the species goes locally extinct on its land, then the listed species may truly be protected in perpetuity.[205] Additionally, if the listed species goes locally extinct on the conservation bank land, there is no need to consider whether the species would have also gone extinct on the developed land if it had not been developed.[206] Under this approach, mitigation for the taking of the listed species on the

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202. FISH AND WILDLIFE SERV., *supra* note 52, at 14 (stating a conservation bank must have an endowment fund to provide for ongoing management costs).

203. *See* FISH AND WILDLIFE SERV., *supra* note 52, at 14 (stating funding of management of conservation bank may be done through establishment of "a non-wasting endowment (i.e., "a fund that generates enough interest each year to cover the costs of the yearly management).").

204. *See id.*

205. *See* Gardner, *supra* note 61, at 75 (stating changing conditions may lead to termination of conservation agreements by court; extinction of the listed species in the wild would result in the species no longer being protected in a conservation bank, likely leading a court to terminate the conservation bank agreement, and thus the species would not be protected by the conservation bank in perpetuity).

206. *See supra* Part III.A for a discussion of species potentially going locally extinct on developed land even if land had never been developed.

developed land is fulfilled as the compensation for the species taken in the development will be for perpetuity.

The second strength of the stepping stone approach is that it financially benefits the conservation bank owner. As the conservation bank owner is required to buy new land or credits if the protected species goes locally extinct, the management plan for that species is different from the management plan for any other protected species on bank land.[207] Consequently, the bank owner should be able to sell credits for other protected species or natural resource values on the conservation bank land.[208] Thus, credit stacking would be possible without the need to consider whether double-dipping is occurring.[209] For example, under the other two approaches, a conservation bank owner could sell credits for a listed species that lives in trees on the bank lands, and protection of those trees would be a part of the management plan for the bank. As a result, under the other approaches, selling credits for the species and for carbon credits would have the same management plan, and thus selling credits for both would be double-dipping. Therefore, under the other approaches, selling credits for the species and for carbon credits would have the same management plan, and in turn selling credits for both would be double-dipping.[210]

Under the stepping stone approach, however, because the bank owner must buy new land or credits if the listed species goes extinct on the bank land, the management plan for the species differs from the management plan for the carbon credits.[211] As a result, the bank owner can sell credits for the listed species and carbon credits without double-dipping. Thus, under the stepping stone approach, bank owners may be able to credit stack more readily than under the other approaches, and therefore the bank land may yield a much higher profit for the bank owner.[212]

The third strength of the stepping stone approach is that it creates an incentive for both the conservation easement holder and the

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207. *See* Fox, *Getting Two for One*, *supra* note 81, at 174-75 (arguing separate land management activities do not result in double-dipping).

208. *Id.*

209. *Id.*

210. *See id.* at 172 (stating selling credits for the same land management activity constitutes double-dipping).

211. *See id.* at 174-75.

212. *Id.*

insurance company to maintain the listed species on the current conservation bank land. If the listed species goes locally extinct on the conservation bank land, the conservation easement holder will lose the endowment for funding the management plan because the endowment funds must then be used to purchase new land or credits.[213] Similarly, the insurance company will be required to help buy new land or credits. Thus, the easement holder and the insurance company will both be financially incentivized to ensure that the management plan on the conservation bank is being thoroughly implemented.

The fourth strength of this approach is that it motivates the conservation bank owner to increase the banked land's natural resources.[214] Under the other approaches, the bank owner has an incentive to increase the protected species' population on the banked land so that it can sell additional credits, but it will not be motivated to increase any other natural resources that may not be sold as credits due to double-dipping.[215] As the bank owner will be able to stack credits without worrying about double-dipping under the stepping stone approach, the bank owner will have an incentive to continue increasing the land's natural resources that may be sold for additional credits. This may lead the bank owner to invest in the ecological quality of the bank land so that he or she may sell credits for other natural resource values that grow or arrive on the land.[216]

The fifth strength of the stepping stone approach is that by allowing credit stacking the conservation easement protects more than just the listed species.[217] Under the stepping stone approach, if the protected species goes extinct on the banked land, a court would be unlikely to terminate the conservation easement because the bank land would still be in use for the protection of other natural resource credits.[218] Consequently, even if the listed species goes locally

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213. *See* FISH AND WILDLIFE SERV., *supra* note 52, at 14 (stating non-wasting endowment should be created for managing conservation bank land).

214. *See* Fox, *Getting Two for One*, *supra* note 81, at 175.

215. *Id.*

216. *Id.* at 174-75.

217. *See* Gardner, *supra* note 61, at 75 (arguing conservation easement drafted to include multiple purposes are unlikely to be terminated by courts due to the doctrine of changed circumstances).

218. *Id.*

extinct on banked land, the habitat will still remain protected indefinitely.

The final strength of the stepping stone approach is that if a protected species goes locally extinct on the conservation bank land and new land or credits are purchased, more land will ultimately be protected by conservation easements than would be protected under the other approaches.[219] As mentioned above, a court would be unlikely to terminate the conservation easement covering the conservation bank land when the protected species goes locally extinct because the land will still be providing protection for other natural resource values for which credits were sold.[220] Thus, when the listed species goes extinct on the conservation bank land and new land or credits are purchased, the conservation bank land will still be protected through a conservation easement, and high quality habitat will continue to remain protected. Therefore, as the habitat range of a listed species changes with changing climate conditions, the listed species will leave protected lands in its wake.

2. Weaknesses of Stepping Stone Approach

The greatest weakness of this approach is that if a conservation bank owner does not want to self-insure, he or she may have difficulty finding insurers willing to insure against the possibility of having to buy new land or credits.[221] However, determining a policy's cost would be difficult for an insurance company with little or no expertise in ecology or climate science. Additionally, there may not be enough conservation banks operating at any one time to allow insurers to diversify their risk.[222] If an insurer is willing to underwrite a policy, it may be willing to only agree to pay a fixed sum if the listed species goes extinct on the conservation bank land, not the amount actually necessary to buy all of the land or credits to

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219. *Id.*

220. *Id.*

221. *See e.g.*, Saul Jay Singer, *Flooding the Fifth Amendment: The National Flood Insurance Program and the "Takings" Clause*, 17 B.C. ENVTL. AFF. L. REV. 323, 334-35 (1990) (indicating federal government assumes risk of national flood insurance program because private insurers do not want to assume the risk).

222. *See* Mead, *supra* note 58, at 28 (stating that as of 2007 there were approximately seventy conservation banks in the U.S.).

make up for the number of individuals of the species no longer being protected on the bank land.

If private insurance companies are not willing to insure conservation banks against local extinction, local or federal governments may be willing to act as insurers.[223] However, the government would likely first require passage of a statute to create the insurance program.[224] Additionally, local or federal governments may not be willing to take on the task of insuring conservation banks due to the complexity of such a task.

A second weakness of this approach is that the cost of new land or credits will almost certainly be more expensive than the price paid for the current conservation bank land due to inflation.[225] However, this would likely be offset to some degree by the fact that the land that would need to be purchased when the species goes locally extinct on bank lands would by necessity contain a listed species. A land with a listed species present may be less attractive for development and may therefore be relatively less expensive than nearby land not containing the listed species.[226]

A final weakness with the stepping stone approach is that the credits purchased by the developer may be more expensive than under the other approaches. As the endowment required under this approach will be larger than under the other approaches, the price of an acre of land in the conservation bank will also be more expensive

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223. *See* Thompson, *supra* note 199, at 483 (stating that laws may be written creating insurance for ecosystem service investments). For instance, the federal government acts as a flood insurer because no private insurers are willing to insure houses at risk of flooding. *See also* Singer, *supra* note 221, at 334-46 (explaining origins of national flood insurance program which provides for administration by private insurers but assumption of risk by federal government and sets rates accordingly).

224. *See, e.g.*, 42 U.S.C. § 4001 (2006) (creating national flood insurance program through statute).

225. *See Historical Inflation Data from 1914 to the Present*, INFLATIONDATA.COM, http://inflationdata.com/inflation/inflation_Rate/historicalinflation.aspx (last visited Jan. 21, 2011) (showing that with the exception of 2009 average annual inflation in the U.S. has ranged between 1.5 and 3.9% since 1999).

226. *See* Mead, *supra* note 58, at 79 (arguing land that cannot be developed because it contains a listed species may have reduced value).

for the developer than under the other approaches.[227] Furthermore, if the cost of credits are higher for the developer, the developer may be less likely to mitigate the taking of the species on the developed land by buying conservation bank credits;[228] the developer may instead choose to mitigate on-site.[229] The stepping stone approach will only work if the cost of conservation bank credits does not become so large that developers find other mitigation options less expensive.[230] However, in considering the impact of global climate change, FWS should impose the same requirements upon on-site mitigation as on conservation bankers. As a result, on-site mitigation may be no less expensive, and potentially considerably more expensive, than buying conservation bank credits under the stepping stone approach.

Similarly, the transaction costs for the bank owner may be higher under the stepping stone approach than under the other approaches.[231] The conservation bank owner should be indifferent to the mitigation ratio set by FWS because the cost of each individual credit will be the same regardless of the mitigation ratio. If the mitigation ratio is low, however, each developer will have to buy fewer bank credits, and therefore the conservation bank owner will likely have to sell credits to a greater number of developers than under the other approaches before selling all of the credits in the bank. As a result, the transaction costs of finding and selling credits to a greater number of developers may be higher under this approach than under the other approaches.[232]

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227. *See* FISH AND WILDLIFE SERV., *supra* note 52, at 14 (indicating several factors will likely influence the required size of endowment).

228. *See* Ruhl et al., *supra* note 5, at 26 (""[P]urchasing bank credits will provide a less expensive means of satisfying mitigation requirements for projects in need of regulatory approvals than would other measures such as dedicating project lands or purchasing and managing conservation lands directly, thus generating the demand for credits").

229. *Id.*

230. *Id.*

231. *See* Daniel A. Farber, *Parody Lost/Pragmatism Regained: The Ironic History of the Coase Theorem*, 83 VA. L. REV. 397, 405 (1997) (defining transaction costs as measurable costs of entering into agreements).

232. *See id.*

D. Weighing the Approaches

Each approach presents its own respective strengths and weaknesses. The stepping stone approach, however, may be more effective than the status quo and future land approach in fulfilling the requirements of the ESA, protecting listed species, and protecting habitat. The stepping stone approach may also financially benefit conservation bank owners if stacking is permitted. Consequently, when FWS considers the impact of global climate change on conservation banking, and how climate change will influence ecological interactions such as source-sink and metapopulation dynamics, the agency should implement the stepping stone approach.

If a protected species goes locally extinct in the conservation bank land, the status quo approach does not fulfill the requirement of the ESA that takings be mitigated because a taking on a different piece of land is no longer being mitigated.[233] The future habitat approach has the opposite problem. Mitigation of the taking on the developed land may occur in the future, but in the present, no mitigation is occurring.[234] This is considered to be unacceptable in the Guidance for conservation banking.[235] Only the stepping stone approach legitimately achieves mitigation of takings in both the present and the future if a protected species goes locally extinct on conservation bank land.[236]

Similarly, the stepping stone approach is the best approach for maintaining listed species on land protected by a conservation easement. Land conserved under a conservation easement is likely to be the most ideal for many species, as development of the land will not be possible and additional activities, such as cattle grazing or off-road vehicle use, may be prohibited as well.[237] The status quo approach requires no protection for the listed species on land protected by a conservation easement once the species goes locally

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233. 16 U.S.C. § 1539(a)(2)(A) (2006); *see supra* Part III.A for a discussion of the status quo approach.

234. *See supra* Part III.B for a discussion of the future habitat approach.

235. *See* FISH AND WILDLIFE SERV., *supra* note 52, at 7-8 (stating credits for restored habitat may be sold "only upon completion and verification of restoration outcomes").

236. *See supra* Part III.C for a discussion of the stepping stone approach.

237. *See* FISH AND WILDLIFE SERV., *supra* note 52, at 10 (stating land use restrictions are to be set in perpetuity).

extinct on the conservation bank land.[238] The future land approach provides no protection for the listed species until the species moves into the land reserved as a conservation bank.[239] A listed species may take decades to finally move into the reserved land, if it ever does, and during that period it is not residing on land protected by a conservation easement.[240] Only the stepping stone approach requires that the listed species continually be on land protected by a conservation easement.

The stepping stone approach is also best at protecting habitat. Under both the status quo and future land approach, the conservation bank mitigates development by conserving land through a conservation easement.[241] The amount of habitat conserved will often be similar to the amount of habitat developed as mitigation ratios are often 1:1.[242] However, if the protected species goes extinct on the conservation bank land, and a court terminates the conservation easement due to impossibility, then no habitat will be conserved.[243] Under the stepping stone approach, if the listed species goes locally extinct on conservation bank land, the bank owner will be required to buy new land or credits. Thus, the new habitat containing the listed species will be protected, but the old habitat will also remain protected because it will likely be fulfilling other purposes of the conservation easement and will therefore not be terminated.[244] As a consequence, under the stepping stone approach, the amount of habitat protected as mitigation for the initial development project may increase through time as the listed species alters its range.

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238. *See Template for a Conservation Bank Agreement, in* CONSERVATION AND BIODIVERSITY BANKING: A GUIDE TO SETTING UP AND RUNNING BIODIVERSITY CREDIT TRADING SYSTEMS 249-65 app. (Nathaniel Carroll, Jessica Fox, & Ricardo Bayon eds., 2008) (providing FWS's required template for a conservation bank agreement, which contains no mention of liability for bank owner to continue protecting species after going locally extinct on conservation bank land).

239. *C.f.* FISH AND WILDLIFE SERV., *supra* note 52, at 10 (stating conservation bank must be established before the first credit in the bank may be sold).

240. *See* Fox, *No-Analog Future, supra* note 125, at 823 (stating it will be difficult to predict species ranges in the future due to global climate change).

241. *See* Fox & Nino-Murcia, *supra* note 101, at 997.

242. *See* Ruhl et al., *supra* note 5, at 31 (stating sixty-five percent of conservation banks have mitigation ratio of 1:1).

243. *See* Gardner, *supra* note 61, at 75 (stating courts may terminate conservation easements due to impossibility).

244. *See* Mead, *supra* note 58, at 75.

Finally, the stepping stone approach may be the most financially beneficial for conservation bank owners. Under the status quo and future land approaches, credit stacking is severely curtailed as the management plan for the protected species will often be similar to the management plan for other natural resource values on the conservation bank land.[245] Thus, double-dipping may prevent most credit stacking.[246] Under the stepping stone approach, however, the liability for buying new land or credits if the protected species goes locally extinct on conservation bank land provides a different management plan for the species, and thus credit stacking will be easier to achieve without double-dipping.[247] The ability to extensively credit stack under the stepping stone approach will likely allow a much greater return on investment for the potential conservation bank owner than possible under the other approaches.

The greatest potential weakness for the stepping stone approach is the difficulty in finding insurers willing to insure against the local extinction of a listed species on conservation bank land.[248] However, even if separate insurance policies are difficult to obtain, the stepping stone approach may still be the best approach. If the protected species goes locally extinct on the conservation bank land and there is not enough money to buy land or credits to fully cover the original credits sold, the endowment created for the management of the conservation bank may be sufficient to buy some land or credits.[249] Thus, at least a significant fraction of the number of credits sold in the original conservation bank will be protected in land covered by a new conservation easement. Therefore, unlike under the status quo or future land approaches, this modified stepping stone approach ensures that a fraction of the listed species will continue to be

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245. *See* Fox, *Getting Two for One*, *supra* note 81, at 174-75.

246. *See supra* Part II.F introducing the distinction between credit stacking and double-dipping.

247. *See* Fox, *Getting Two for One*, *supra* note 81, at 174-75.

248. *See supra* Part III.C.2 for a discussion of the potential difficulties in finding insurance for conservation banking under the stepping stone approach.

249. *See* FISH AND WILDLIFE SERV., *supra* note 52, at 14 (stating endowment must be created for managing conservation bank land); Craig Denisoff, *Business Considerations, in* CONSERVATION AND BIODIVERSITY BANKING: A GUIDE TO SETTING UP AND RUNNING BIODIVERSITY CREDIT TRADING SYSTEMS 109, 111-12 (Nathaniel Carroll, Jessica Fox, & Ricardo Bayon eds., 2008) (noting the large sum of principal an endowment fund may require).

protected, additional habitat will continue to be protected, and the conservation bank owner will continue to benefit financially from the ability to stack credits.

As a consequence of all of the aforementioned considerations, requiring conservation bank owners to be liable for purchasing new land or credits if the protected species on the bank land goes locally extinct appears to be the best approach for dealing with the potential effects of global climate change and complex ecological dynamics on conservation banks.

IV. CONCLUSION

When the FWS confronts how global climate change considerations should be incorporated into conservation banking agreements, the agency will likely consider several approaches. Taking into account these various options, FWS should act to ensure that conservation banks truly protect the threatened or endangered species they were created to shelter in perpetuity. The optimal means for doing this may be through an approach that requires conservation bank owners to purchase land containing the protected species if the species goes locally extinct on the original conservation bank land. Such an approach may actually benefit bank owners if it is coupled with the ability of bankers to sell credits for additional ecosystem services that they are currently precluded from selling due to the possibility of double-dipping.

Species are dynamic, and frequently changing in population number and distribution.[250] Global climate change and complex ecological interactions amplify those dynamics.[251] Only by adopting strategies that are themselves dynamic will threatened and endangered species be protected.[252] Global climate change and ecological interactions will cause protected species to move, conservation banks should be forced to move as well.

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250. *See* FISH AND WILDLIFE SERV., *supra* note 52, at 9 (recognizing populations vary in size due to natural variation); *see also* Mace et. al., *supra* note 25, at 3748.

251. *See* Fox, *No-Analog Future, supra* note 125, at 823 (stating global climate change will reshuffle ecological communities into novel ecosystems unknown today).

252. *See* Rayfield et al., *supra* note 184, at 446 (finding population would be better protected by dynamic protected areas than static protected areas).