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**The Legal Status of  
Environmental Credit Stacking**

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# The Legal Status of Environmental Credit Stacking

Royal C. Gardner\* and Jessica Fox\*\*

*Environmental credit markets have been established to offset impacts to wetlands, endangered species habitat, water quality, and the global climate system. As these markets mature, participants are exploring the concept of credit stacking, whereby a conservation project or parcel produces different types of mitigation credits for multiple markets (such as wetland and endangered species credits or water quality and carbon sequestration credits). If these stacked credits are unbundled, they may be sold in different credit markets to offset impacts from different activities. Such transactions raise concerns about additionality, interagency coordination, verification of ecological improvements, monitoring and management, and transparency. This Article examines eight different credit stacking scenarios and the emerging rules that govern the sale of credits. Generally, there is diversity in how different federal and state agencies handle credit stacking, and they have not issued clear rules on when unbundling stacked credits is permissible. The Article closes with considerations that agencies could take into account in developing a credit stacking protocol to avoid double counting and ecological loss. The credit stacking scenario where it may be most appropriate to consider unbundling is when the accounting units are pollutant-specific, such as is the case with water quality and carbon markets.*

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#### INTRODUCTION

*[T]he record clearly shows that conservation can't succeed by charity alone. It has a fighting chance, however, with well-designed appeals to self-interest. The challenge now is to change the rules of the game so as to produce new incentives for environmental protection, geared to both society's long-term well-being and individuals' self-interest. . . . A great unanswered question is whether the drive for profits, which has done so much to harm the planet, can possibly be harnessed to save it.*

—GRETCHEN C. DAILY AND KATHERINE ELLISON, *THE NEW ECONOMY OF NATURE*  
12 (2002).

*Pigs get fed, hogs get slaughtered.*

—Anonymous

Environmental credit markets have been established to offset impacts to wetlands, endangered species habitat, water quality, and the global climate

system. As Daily and Ellison suggest, the theory behind these markets is that economic incentives may encourage environmentally beneficial actions. Although concerns about the ecological validity of these markets remain,<sup>1</sup> agencies and market participants are considering new methods to increase the profitability of environmental credit programs. In particular, they are exploring and beginning to implement the concept of credit stacking, whereby a conservation project or parcel can produce credits for multiple markets. Thus, if a company restores a forested wetland, it might generate wetland, endangered species, water quality, *and* carbon sequestration credits. The rules governing the sale of these stacked credits in multiple markets are still largely in development, and it is critical that the proper balance be struck—to protect both the environment and the market participants who have invested time and money to create mitigation credits. If market participants overreach or if agencies are too generous in allowing credit transactions, the environment may suffer. Then the market participants—who may be sharply criticized or even subject to legal action—may find themselves treated more like the hog, rather than the pig.

Part I provides background on wetland mitigation banks, conservation banks for species habitat, water quality trading programs, and greenhouse gas emission trading programs. With government regulation precipitating both the supply and demand side of the equation, these markets are dependent on agency action. Despite different degrees of regulatory uncertainty, billions of dollars are invested in these markets annually.<sup>2</sup> Part II examines the practice of credit stacking, discussing different stacking scenarios and the rules that govern the sale of credits. Although there are various examples of projects with stacked credits, there are fewer cases where agencies have permitted these credits arising from the same area or conservation action to be unbundled and sold to multiple markets. Such transactions raise concerns about whether environmental impacts are truly being offset. Finally, Part III offers considerations for a protocol to manage credit stacking. Ideally, any such protocol would take into account questions of additionality, agency coordination and capacity, long-term management, and transparency. Permitting stacked credits to be sold in different markets appears to be most defensible for pollutant-specific credits. It is much more problematic when credits representing multiple ecosystem functions are unbundled and sold

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1. See, e.g., Margaret A. Palmer & Solange Filoso, *Restoration of Ecosystem Services for Environmental Markets*, 325 SCI. 575, 575–76 (2009). See also *Citizens Climate Lobby v. Cal. Air Res. Bd.*, No. CGC-12-519554, 2013 WL 861396 (Cal. Super. Ct. Jan. 25, 2013) (rejecting a challenge to California's additionality rules for its greenhouse gas cap-and-trade program); *Complaint, Food & Water Watch v. U.S. EPA* (D.D.C. Oct. 3, 2012) (No. 12-cv-01639), 2012 WL 4668078 (challenging water quality trading in Chesapeake Bay region).

2. The Environmental Law Institute examined the total costs associated with wetland and stream mitigation in fiscal year 2003 and estimated it “was between \$1.9 billion and \$4.0 billion, with a probable midpoint of around \$2.95 billion.” ENVTL. LAW INST., *MITIGATION OF IMPACTS TO FISH AND WILDLIFE HABITAT: ESTIMATING COSTS AND IDENTIFYING OPPORTUNITIES* 3, 27 (2007), available at [http://www.elistore.org/reports\\_detail.asp?ID=11248&topic=Wetlands](http://www.elistore.org/reports_detail.asp?ID=11248&topic=Wetlands).

individually in multiple markets. Credit stacking has the potential to be a useful environmental tool, but only if it is properly structured “to give the invisible hand of free-market economics a green thumb.”<sup>3</sup>

## I. A BRIEF PRIMER ON U.S. ENVIRONMENTAL MARKETS

The theory behind environmental credit markets is relatively straightforward. Environmental gain from a conservation action is quantified as a unit (e.g., acres, tons), which then may be sold, traded, or otherwise transferred to someone who needs mitigation to offset impacts to the same resource type. A market system can produce these “credits” at a lower cost and/or greater convenience than more traditional approaches to environmental mitigation, such as in-lieu fees or project-by-project mitigation. Moreover, a market can create economic incentives to protect natural resources by creating value in land that would have otherwise been viewed as financially worthless, or worse, a liability. Lastly, a market may be able to protect the natural resources more effectively by ensuring rigorous standards for the environmental credits, which are not necessarily enforced for in-lieu fee payments or one-off mitigation projects.

When constructing a market-based approach to environmental mitigation, however, one must keep in mind the primary objective: The goal is a cost-efficient and ecologically effective method to offset impacts to natural resources. The goal is not to protect the market itself; the market is simply a tool for better mitigation. Furthermore, while market-based approaches may provide important ancillary ecosystem benefits, they are not based on generalized ecosystem gains; they are fundamentally an offset mitigation system.

The national experience with Clean Air Act (CAA) emissions trading encouraged the development of environmental credit markets.<sup>4</sup> This Part examines the next generation of environmental credit markets: wetland mitigation banking, conservation banking, water quality trading, and greenhouse gas emissions trading. Each individual market can involve different regulatory agencies and levels of government, different units of measurements for credits, and different legal frameworks. Accordingly, the multitude of variables can complicate efforts to stack and sell credits in multiple markets.

### A. Wetland Mitigation Banking

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3. EDWARD O. WILSON, *THE DIVERSITY OF LIFE* 283 (1992).

4. DALLAS BURTRAW & SARAH JO SZAMBELAN, RES. FOR THE FUTURE, RFF DP 09-40, U.S. EMISSIONS TRADING MARKETS FOR SO<sub>2</sub> AND NO<sub>x</sub> 3 (2009), available at <http://www.rff.org/documents/RFF-DP-09-40.pdf>. Under the CAA, a power plant is assigned a certain number of allowances (initially tons of sulfur dioxide and later nitrogen oxides) that establish a cap on emissions. If the power plant undertakes some action—such as installing pollution control equipment, switching fuel, or simply reducing fuel consumption—and the action results in fewer emissions, it would have excess allowances it could sell to other electric utilities. The CAA emissions trading program is credited with reducing sulfur dioxide and nitrogen oxide emissions in a relatively efficient manner. *Id.* at 2.

The term “wetlands” encompasses a broad range of ecosystems. The major classes of wetlands in the United States are freshwater marsh, tidal salt and brackish marsh, prairie pothole, fen, bog, swamp, bottomland hardwood, and mangrove.<sup>5</sup> Accordingly, a wetland may be a forested system; a freshwater, saltwater, or estuarine system; a palustrine, lacustrine, or relatively isolated system; and permanent, seasonal, or ephemeral. An individual wetland may also be large or small, and it is estimated that approximately 75 percent of wetlands in the contiguous United States are located on private property.<sup>6</sup>

Throughout most of this country’s history, wetlands were viewed as wastelands or nuisances.<sup>7</sup> They were filled, reclaimed, converted, or otherwise destroyed so that the land could be put to other uses, such as agriculture.<sup>8</sup> Today, society recognizes the many important ecosystem services that wetlands provide, including food, flood protection, and water purification.<sup>9</sup> Thus, rather than encouraging agricultural operations to expand into wetland areas, the federal government now penalizes those farmers who do,<sup>10</sup> and it even offers financial incentives to voluntarily restore former wetland areas to their natural state.<sup>11</sup> Urban and rural development now cause the greatest wetland losses in terms of area.<sup>12</sup>

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5. NAT’L RESEARCH COUNCIL, WETLANDS: CHARACTERISTICS AND BOUNDARIES 21 (1995); *see also* WILLIAM J. MITSCH & JAMES G. GOSSELINK, WETLANDS 31 (4th ed. 2007).

6. EPA, THREATS TO WETLANDS 2 (2001), *available at* <http://water.epa.gov/type/wetlands/outreach/upload/threats.pdf>.

7. *Leovy v. United States*, 177 U.S. 621, 636 (1900) (“If there is any fact which may be supposed to be known by everybody, and therefore by courts, it is that swamps and stagnant waters are the cause of malarial and malignant fevers, and that the police power is never more legitimately exercised than in removing such nuisances.”); *see also* ROYAL C. GARDNER, LAWYERS, SWAMPS, AND MONEY: U.S. WETLAND LAW, POLICY, AND POLITICS 5–13 (2011).

8. T.E. DAHL, U.S. FISH & WILDLIFE SERV., WETLANDS: LOSSES IN THE UNITED STATES: 1780’S TO 1980’S, at 2 (1990); T.E. DAHL, U.S. FISH & WILDLIFE SERV., STATUS AND TRENDS OF WETLANDS IN THE CONTERMINOUS UNITED STATES 1998–2004, at 41 (2006) [hereinafter DAHL (2006)].

9. MILLENNIUM ECOSYSTEM ASSESSMENT, ECOSYSTEMS AND HUMAN WELL-BEING: WETLANDS AND WATER SYNTHESIS 1–4 (2005), *available at* <http://www.maweb.org/en/Synthesis.aspx>. The MA (as it is known) identifies four primary categories of ecosystem services that wetlands provide: provisioning (food, fresh water, fiber and fuel, biochemical, genetic materials); regulating (climate regulation, water regulation such as hydrological flows, water purification and waste treatment, erosion regulation, natural hazard regulation, pollination); cultural (spiritual and inspirational, recreational, aesthetic, educational); and supporting (soil formation, nutrient cycling). *Id.*

10. 16 U.S.C. § 3821 (2012). The Swampbuster Program uses disincentives to discourage the conversion of wetlands to agricultural production. MARGARET “PEGGY” STRAND & LOWELL M. ROTHCHILD, WETLANDS DESKBOOK 172–73 (3d ed. 2009).

11. The Conservation Reserve Program pays farmers to not farm their environmentally sensitive land, including erodible lands and wetlands. Landowners voluntarily enter into ten- to fifteen-year contracts, and the government pays rent for the land excluded from production. 16 U.S.C. § 3831; STRAND & ROTHCHILD, *supra* note 10, at 178–79. The Wetlands Reserve Program provides incentives for wetland restoration through easements and cost-share agreements. 16 U.S.C. § 3837; STRAND & ROTHCHILD, *supra* note 10, at 179–80.

12. DAHL (2006), *supra* note 8, at 16 (reporting that urban and rural development accounted for approximately 61 percent of wetland losses from 1998 to 2004).

At the federal level, the Clean Water Act (CWA) is the principal regulatory mechanism that protects wetlands.<sup>13</sup> The CWA prohibits the discharge of dredged or fill material into certain wetlands without a section 404 permit from the U.S. Army Corps of Engineers.<sup>14</sup> When deciding whether to grant a permit (and what conditions should attach to the permit), the Corps must apply U.S. Environmental Protection Agency (EPA) regulations.<sup>15</sup> The regulations require an “avoid-minimize-compensate” sequence.<sup>16</sup> First, the permit applicant must demonstrate that there are no less environmentally damaging practicable alternatives to the proposed project and that wetland impacts cannot be avoided.<sup>17</sup> Next, the permit applicant must minimize those unavoidable impacts, perhaps through changing the design, precise location, and timing of the project.<sup>18</sup> Finally, the permit applicant must compensate for any remaining impacts by promising to restore, create, enhance, and/or preserve other wetlands.<sup>19</sup> Ideally, the compensatory mitigation will offset the permitted project’s impacts, thereby achieving “no net loss” of wetland area and functions.<sup>20</sup> This ideal, however, has not been achieved on the ground.

Study after study has revealed problems with compensatory mitigation.<sup>21</sup> Sometimes permittees simply ignored their obligation to provide wetland mitigation. Other times, permittees attempted mitigation projects, but their efforts failed. Even if a mitigation project met its performance standards, the result was not necessarily a self-sustaining wetland. The Corps rarely required permittees to engage in long-term stewardship of the sites and rarely brought enforcement actions for mitigation failures. A National Research Council committee found that the CWA section 404 program was not meeting the “no net loss” goal for functions, but could not quantify the “magnitude of the shortfall.”<sup>22</sup> Several members of that committee later attempted to quantify the shortfall, finding “that only 21 percent of the mitigation sites met various tests of ecological equivalency to the functions lost.”<sup>23</sup>

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13. 33 U.S.C. § 1251 (2006). The CWA does not apply to all wetlands; several U.S. Supreme Court decisions have wrestled with the issue of defining jurisdictional boundaries. GARDNER, *supra* note 7, at 35–56.

14. 33 U.S.C. § 1311 (prohibiting the discharge of pollutants without a permit); *id.* § 1362(6) (defining “pollutant” to include dredged and fill material).

15. *Id.* § 1344(b)(1); 33 C.F.R. § 323.6 (2013).

16. 40 C.F.R. § 230 (2013).

17. *Id.* § 230.10(a).

18. *Id.* § 230.10(d).

19. *Id.* § 230.75(d).

20. *Id.* § 230.91(a)(1); Compensatory Mitigation for Losses of Aquatic Resources, 73 Fed. Reg. 19594, 19594 (Apr. 10, 2008) (to be codified at 33 C.F.R. pts. 325, 332 & 40 C.F.R. pt. 230).

21. The Compensatory Mitigation page on EPA’s website contains links to studies. *See Compensatory Mitigation*, EPA, [http://water.epa.gov/lawsregs/guidance/wetlands/wetlandsmitigation\\_index.cfm#evaluations](http://water.epa.gov/lawsregs/guidance/wetlands/wetlandsmitigation_index.cfm#evaluations) (last updated Sept. 11, 2013).

22. NAT’L RESEARCH COUNCIL, COMPENSATING FOR WETLAND LOSSES UNDER THE CLEAN WATER ACT 3 (2001).

23. R. Eugene Turner et al., *Count It by Acre or Function—Mitigation Adds Up to Net Loss of Wetlands*, NAT’L WETLANDS NEWSL., Nov.–Dec. 2001, at 5, 6.

With permittee-responsible mitigation's poor track record, the Corps and EPA considered mitigation banking as an alternative.<sup>24</sup> In a mitigation banking system, a third party—the mitigation banker—restores, enhances, creates, and/or preserves a wetland, thereby generating wetland credits.<sup>25</sup> Permittees can then (with agency approval) satisfy their compensatory mitigation requirements by purchasing these credits. The mitigation banker assumes legal responsibility for providing the compensatory mitigation.<sup>26</sup>

The Corps and EPA have identified a number of potential ecological advantages to mitigation banking, including larger consolidated tracts, timing, interagency oversight, and increased efficiencies.<sup>27</sup> From the permittee's perspective, the benefit is certainty: fixed costs and no continuing legal responsibility.<sup>28</sup> The credit currency is often expressed in terms of acres or wetland functions. The Corps is the lead federal agency responsible for mitigation bank approval, but state agencies are responsible for approval of wetland credits that satisfy state regulatory requirements. Accordingly, enforcement of the "no net loss" goal of the CWA and similar state laws is the driver for wetland mitigation credits.

Initially, the federal rules governing wetland mitigation banks were contained in guidance documents.<sup>29</sup> In 2008, at the behest of Congress, the Corps and EPA finished a joint rulemaking that placed mitigation banking on a firmer legal footing.<sup>30</sup> Federal regulations (that apply to all aquatic resources, not just wetlands) now specify how mitigation banks are to be established and operated. In particular, the agencies encourage wetland restoration as the primary method to offset impacts.<sup>31</sup> Significantly, the 2008 regulations establish a "mitigation hierarchy" with mitigation banking as the preferred option for compensatory mitigation.<sup>32</sup>

Congress has also assisted the market for wetland mitigation banking by expressing a preference for it over other mitigation options. If federally funded transportation projects or water resource development projects negatively affect

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24. GARDNER, *supra* note 7, at 105–09. In-lieu fee mitigation, where a permittee pays money to a non-profit organization or a government agency in lieu of performing the mitigation itself, is another alternative to permittee-responsible mitigation. *Id.* at 129–30. For a discussion about the challenges associated with in-lieu fee mitigation, see *id.* at 129–40.

25. 33 C.F.R. § 332.2 (2013); GARDNER, *supra* note 7, at 112–13.

26. Corps regulations establish a shift of "responsibility" but do not use the word "liability." 33 C.F.R. § 332.3(l); see also Royal C. Gardner, *Whither Wetland Mitigation Liability (Part 2)*, NAT'L WETLANDS NEWSL., Nov.–Dec. 2011, at 10, 10–11.

27. Compensatory Mitigation for Losses of Aquatic Resources, 73 Fed. Reg. 19594, 19595, 19602 (Apr. 10, 2008) (codified at 33 C.F.R. pts. 325, 332 & 40 C.F.R. pt. 230).

28. See Consent Decree, *United States v. Century Homebuilders*, No. 09-22258-CIV-KING (S.D. Fla. Dec. 14, 2010); see also Royal C. Gardner, *Whither Wetland Mitigation Liability (Part 1)?*, NAT'L WETLANDS NEWSL., May–June 2011, at 8, 8–9.

29. GARDNER, *supra* note 7, at 111–27; see Federal Guidance for the Establishment, Use and Operation of Mitigation Banks, 60 Fed. Reg. 58605 (Nov. 28, 1995).

30. Compensatory Mitigation for Losses of Aquatic Resources, 73 Fed. Reg. at 19,595.

31. 40 C.F.R. § 230.93(a)(2) (2013).

32. *Id.* § 230.93(a)(1).



wetlands, Congress has stated that mitigation bank credits (if available) should be the primary offset mechanism.<sup>33</sup> Consequently, the number of wetland mitigation banks has increased dramatically. In 1992, the Environmental Law Institute reported that there were 46 mitigation banks, only one of them entrepreneurial.<sup>34</sup> By 2005, the total number approved was 405, and more than 72 percent were entrepreneurial.<sup>35</sup> As of March 2013, the Corps reported that it had approved 1308 banks with more in development.<sup>36</sup>

### B. Conservation Banking

Threatened and endangered species face a variety of risks. One of the principal threats to the viability of many of these species is habitat modification, which often occurs through: resource use and extractive activities; construction projects; agricultural production; pollution; and the spread of exotic species.<sup>37</sup> One study estimated that almost 80 percent of federally protected species reside partially or wholly on privately owned property.<sup>38</sup> There is also often an overlap with these species' habitats and wetlands. The EPA reports that more than half of all threatened and endangered species rely on wetlands during some part of their life cycle.<sup>39</sup>

At the federal level, the Endangered Species Act (ESA) is the primary regulatory mechanism to protect threatened and endangered species and their habitats.<sup>40</sup> The ESA prohibits the "taking" of any federally listed species.<sup>41</sup> "Take" is broadly defined to include any type of harm to a protected individual

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33. The Transportation Equity Act for the 21st Century (TEA-21) established a preference for mitigation banks for mitigating wetland impacts of federally funded highway projects. Pub. L. No. 105-178, § 1108, 112 Stat. 107, 139 (1998) (codified as amended at 23 U.S.C. § 119(g)(4) (2006)). The Water Resources Development Act of 2007 established mitigation bank preference for Corps projects. Pub. L. 110-114, § 2036(c), 121 Stat. 1041, 1094 (2007) (codified at 33 U.S.C. § 2317b(1) (2006)).

34. ENVTL. LAW INST., BANKS AND FEES: THE STATUS OF OFF-SITE WETLAND MITIGATION IN THE UNITED STATES 37 (2002).

35. JESSICA WILKINSON & JARED THOMPSON, ENVTL. LAW INST., 2005 STATUS REPORT ON COMPENSATORY MITIGATION IN THE UNITED STATES 4, 8 (2006).

36. BOB BRUMBAUGH & PALMER HOUGH, A TRAINING COURSE FOR MITIGATION BANKING & IN-LIEU FEE PROGRAM INTERAGENCY REVIEW TEAMS: OVERVIEW OF FEDERAL THIRD PARTY MITIGATION POLICY AND REGULATIONS, SESSION 1, at 31 (2013) (on file with the Ecology Law Quarterly). Details about specific banks can be found on RIBITS. *Regulatory In-Lieu Fee and Bank Information Tracking System (RIBITS)*, U.S. ARMY CORPS ENGINEERS, <https://rsgisias.crrel.usace.army.mil/ribits/f?p=107:2:6177678384713520> (last visited Feb. 24, 2013).

37. Joshua J. Lawler et al., *The Scope and Treatment of Threats in Endangered Species Recovery Plans*, 12 ECOLOGICAL APPLICATIONS 663, 664 (2002).

38. Daniel R. Simmons & Randy T. Simmons, *The Endangered Species Act Turns 30*, 26 REGULATION 6, 6 (2003), available at <http://object.cato.org/sites/cato.org/files/serials/files/regulation/2003/12/mercereportcom.pdf>.

39. EPA, OFFICE OF WATER, EPA843-F-06-004, ECONOMIC BENEFITS OF WETLANDS 3 (2006), available at <http://water.epa.gov/type/wetlands/upload/wetlands-economic-benefits.pdf>.

40. LAWRENCE R. LIEBESMAN & RAPE PETERSEN, ENVTL. LAW INST., ENDANGERED SPECIES DESKBOOK 5 (2d ed. 2010).

41. 16 U.S.C. § 1538(a)(1) (2012).

animal,<sup>42</sup> including in some cases significant habitat modification.<sup>43</sup> Nevertheless, the U.S. Fish and Wildlife Service (FWS) and National Marine Fisheries Service (NMFS) may authorize activities that result in the incidental take of a species.<sup>44</sup>

Under ESA section 7, the agencies may issue an incidental take statement (ITS) for projects that have some federal nexus.<sup>45</sup> The ITS may mandate that impacts be minimized.<sup>46</sup> Under ESA section 10, the agencies may issue an incidental take permit (ITP) for purely private actions and require offsets through a habitat conservation plan.<sup>47</sup> Accordingly, whether a project is authorized through an ITS or ITP, the project proponent or permittee will need to compensate for adverse impacts to protected species. Hence, similar to the CWA, the ESA also follows an avoid-minimize-compensate sequence.

As has been the case with permittee-responsible wetland mitigation under the CWA, conventional mitigation in the ESA context has been problematic. The conventional approach involved on-site mitigation (on or adjacent to the project area).<sup>48</sup> The result was “many small, disjunct mitigation sites,”<sup>49</sup> and the long-term prospects for such sites were not positive. As one FWS official explained: “Historically, these mitigation sites have little or no long-term management requirement on the part of the landowners, cannot be adequately defended from surrounding incompatible land uses, are inadequately monitored for compliance and effectiveness of the mitigation and rarely serve their intended long-term purposes.”<sup>50</sup>

While agency officials were concerned from an ecological perspective, developers and property owners were also displeased. The presence of a protected species on private property was viewed as a detriment because it limited land management activities.<sup>51</sup> The ITS and ITP process could be expensive and time-consuming, which led some ESA critics to advocate the

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42. See *id.* § 1532(19) (defining “take” as “harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct”).

43. *Babbitt v. Sweet Home Chapter of Cmty. for a Great Or.*, 515 U.S. 687, 708 (1995).

44. The FWS is responsible for administering the ESA for most species, and the NMFS administers the Act for marine species. Royal C. Gardner, *Legal Considerations*, in *CONSERVATION & BIODIVERSITY BANKING: A GUIDE TO SETTING UP AND RUNNING BIODIVERSITY CREDIT TRADING SYSTEMS* 69, 70 (Nathaniel Carroll, Jessica Fox & Ricardo Bayon eds., 2008); Deborah L. Mead, *History and Theory: The Origin and Evolution of Conservation Banking*, in *CONSERVATION & BIODIVERSITY BANKING: A GUIDE TO SETTING UP AND RUNNING BIODIVERSITY CREDIT TRADING SYSTEMS*, *supra*, at 9, 13. The FWS has been more active with conservation banking than NMFS. See Mead, *supra*, at 28.

45. 16 U.S.C. § 1536(b)(4); Mead, *supra* note 44, at 14. A federal nexus is established if a federal agency issues a permit or finances the project. Mead, *supra* note 44, at 14.

46. 16 U.S.C. § 1536(b)(4)(C)(ii).

47. *Id.* § 1539(a).

48. Mead, *supra* note 44, at 15.

49. *Id.*

50. *Id.*

51. Gardner, *supra* note 44, at 69.

“shoot, shovel, and shut up” approach to the issue.<sup>52</sup> Private projects with no federal connection proved particularly troublesome. Although the section 7 process has timelines for consultation and decisions,<sup>53</sup> the development of a habitat conservation plan under section 10 does not have similar deadlines, leading to a protracted permitting process on private lands.<sup>54</sup> Furthermore, the alternative of paying an in-lieu fee to a nonprofit organization or government agency, rather than implementing an on-the-ground project, created concerns about when and whether the fee would in fact be applied toward effective conservation.<sup>55</sup>

Conservation banking was viewed as an alternative approach that might satisfy the concerns of the agencies as well as property owners and developers.<sup>56</sup> The first formal conservation banking policy was adopted at the state level in 1995 when California issued its “[o]fficial policy on conservation banks.”<sup>57</sup> The policy contemplated that private and public lands would be managed for their natural resource values, thus producing credits, which developers could use to satisfy mitigation requirements under state law.<sup>58</sup> Although the FWS did not have a similar policy at the time, it endorsed the concept and began to permit ITS and ITP recipients to purchase credits from conservation banks to meet ESA offset obligations.<sup>59</sup> In 2003, FWS announced national guidance on conservation banking.<sup>60</sup> This policy document remains the primary source for federal rules governing conservation banks.

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52. *Id.* at 69–70 (citing Ralph R. Reiland, *Shoot, Shovel & Shut Up*, LEWROCKWELL.COM (Apr. 6, 2004), <http://www.lewrockwell.com/orig4/reiland3.html>).

53. 16 U.S.C. § 1536(b).

54. *See id.* § 1539 (not including any deadlines for the ITP process); Christopher S. Mills, *Incentives and the ESA: Can Conservation Banking Live Up to Potential?*, 14 DUKE ENVTL. L. & POL’Y FORUM 523, 526, 531 (2004) (explaining that habitat conservation plans “are extremely expensive, burdensome, and fraught with delay”).

55. Craig Denisoff, *Business Considerations*, in CONSERVATION & BIODIVERSITY BANKING: A GUIDE TO SETTING UP AND RUNNING BIODIVERSITY CREDIT TRADING SYSTEMS *supra* note 44, at 109, 116 (observing that “most in-lieu [fee] programmes do not acquire or even identify the mitigation land until enough funds are collected to implement a project, which is often many years after the actual impacts occurred”).

56. Wayne White, *The Advantages and Opportunities*, in CONSERVATION & BIODIVERSITY BANKING: A GUIDE TO SETTING UP AND RUNNING BIODIVERSITY CREDIT TRADING SYSTEMS, *supra* note 44, at 33, 36–40.

57. DOUGLAS P. WHEELER & JAMES M. STROCK, CAL. NATURAL RES. AGENCY, OFFICIAL POLICY ON CONSERVATION BANKS (1995), *available at* <http://ceres.ca.gov/wetlands/policies/mitbank.html>.

58. *Id.* California recently enacted a statute that expressly authorizes and governs conservation banking. CAL. FISH & GAME CODE §§ 1797–1799.1 (West 2013).

59. *See* Mead, *supra* note 44, at 24 (explaining that FWS had approved “[a]pproximately 45 conservation banks” before issuing its national guidance policy).

60. Memorandum from the U.S. Fish & Wildlife Serv. to Reg’l Dirs., Regions 1–7, & Manager, Cal. Nev. Operations, Guidance for the Establishment, Use, and Operation of Conservation Banks (May 2, 2003), *available at* [http://www.fws.gov/endangered/esa-library/pdf/Conservation\\_Banking\\_Guidance.pdf](http://www.fws.gov/endangered/esa-library/pdf/Conservation_Banking_Guidance.pdf) [hereinafter Conservation Bank Guidance]. The Southwest Region of NMFS has also issued guidance on conservation banking. Memorandum from Chris Yates, Assistant Reg’l Adm’r, Protected Res., Sw. Region, NMFS, to PRD Office Supervisors, Sw. Region, NMFS, Guidance for the Review, Establishment, Use and Operation of Conservation Banks and In-Lieu Fee Mitigation Programs

Like wetland mitigation banking rules, FWS policy requires an agreement between the credit seller and the agency. This conservation banking agreement spells out the biological value of the site, the credit methodology, the bank's service area, performance standards, and long-term management plans.<sup>61</sup> Credits are typically accounted for in acres of habitat or, less frequently, number of breeding pairs or individuals.<sup>62</sup> At the federal level, FWS or NMFS is responsible for approving bank agreements (depending on the species),<sup>63</sup> while state wildlife agencies have authority over species banks for state law purposes.<sup>64</sup> Thus, the driver for species markets is the enforcement of the ESA and similar state laws.

The FWS policy identifies benefits associated with conservation banking, which are similar to those associated with wetland mitigation banking: it protects larger sites with increased habitat connectivity; saves permittees time and money in the review process; provides landowners an additional revenue stream (thereby releasing some pressure on the ESA because landowners may no longer view listed species as economically detrimental); avoids uncertainty that an in-lieu fee will be appropriately applied towards project implementation; and brings together financial resources and expertise not available on the project-by-project approach.<sup>65</sup> A significant difference between wetland mitigation banking and conservation banking is that whereas the Corps and EPA prefer restoration of wetlands, the FWS prefers preservation of habitat.<sup>66</sup>

Since California was an initial leader in conservation banking policy, it is not surprising that the majority of banks (80 out of 106) have been established there.<sup>67</sup> Interest in banking is spreading to other FWS regions, and NMFS has approved several salmon banks along the Pacific coast.<sup>68</sup>

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(Oct. 19, 2011), available at <http://www.mitigationbanking.org/pdfs/2011-nmfsguidancememo.pdf>. NMFS has not yet issued guidance at the national level, however.

61. Mead, *supra* note 44, at 15–17.

62. Gardner, *supra* note 44, at 76 (citing Jessica Fox et al., *Conservation Banking*, in *THE ENDANGERED SPECIES ACT AT THIRTY*, VOL 2: CONSERVING BIODIVERSITY IN HUMAN-DOMINATED LANDSCAPES 228, 234 (J. Michael Scott et al. eds., 2006)).

63. *Id.* at 70.

64. Mead, *supra* note 44, at 28.

65. Conservation Bank Guidance, *supra* note 60, at 1–2. See also White, *supra* note 56, at 33–41.

66. Mead, *supra* note 44, at 24.

67. See U.S. ARMY CORPS OF ENG'RS, RIBITS: APPROVED CONSERVATION BANKS (2013) (on file with authors); *Endangered Species Program, For Landowners: Conservation Banking*, U.S. FISH & WILDLIFE SERV., <http://www.fws.gov/endangered/landowners/conservation-banking.html> (last updated Aug. 15, 2013) (noting that there are more than 105 approved banks in the United States, and showing that most of these banks are in California). For a recent evaluation of conservation banks in California, see David Bunn et al., *Reforms Could Boost Conservation Banking by Landowners*, 67 CAL. AGRIC. 86 (2013), available at <http://californiaagriculture.ucanr.edu/landingpage.cfm?article=ca.v067n02p86&fulltext=yes>.

68. Tom Cannon & Howard Brown, *Fish Banking*, in *CONSERVATION & BIODIVERSITY BANKING: A GUIDE TO SETTING UP AND RUNNING BIODIVERSITY CREDIT TRADING SYSTEMS*, *supra* note 44, at 159, 159–60. In 2011, the Southwest Region of NMFS issued a guidance document about conservation banking and in-lieu fees. Memorandum from Chris Yates, *supra* note 60.

*C. Water Quality Trading*

In 1972, Congress declared the goal that our nation's waters would be fishable and swimmable by eliminating the discharge of pollutants by 1985.<sup>69</sup> That goal has proven to be elusive. As of January 2013, states had assessed 28 percent of the nation's rivers and streams (in terms of miles).<sup>70</sup> Of the rivers and streams assessed, approximately half are considered impaired.<sup>71</sup> A larger percentage of lakes, reservoirs, and ponds have been assessed (43 percent based on acres), but about two-thirds of these waters are impaired.<sup>72</sup> Similarly negative findings are seen for bays and estuaries (37 percent of square mileage assessed; 66 percent impaired), coastal shorelines (14 percent of mileage assessed; 86 percent impaired), and ocean and near coastal waters (3 percent of square mileage assessed; 66 percent impaired).<sup>73</sup> The waters are low quality due to the presence of various pollutants and stressors, including pathogens, sediment, nutrients, mercury, and temperature.<sup>74</sup> The sources of these pollutants are numerous, but some of the primary contributors are agricultural activities, atmospheric deposition (from a mix of stationary and mobile sources such as power plants and motor vehicles), and municipal sewer discharges.<sup>75</sup> The fact that some sources—such as factories—may add pollutants directly into a waterbody via an identifiable pipe (known as a point source discharge) and other sources—such as agricultural runoff and atmospheric deposition—may result in an indirect, diffuse addition (known as a nonpoint source discharge) adds a layer of complexity in fashioning a regulatory response,<sup>76</sup> as do the varied roles of the federal and state governments.

The CWA is the primary federal law that governs water quality, but it establishes a cooperative framework with the states. As an initial matter, all point source discharges into the waters of the United States are prohibited without a permit, such as a CWA section 402 (NPDES) permit granted by the EPA.<sup>77</sup> With EPA's approval, a state may assume responsibility for the

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69. See 33 U.S.C. § 1251(a)(1) (2006) (stating that "it is the national goal that the discharge of pollutants into the navigable waters be eliminated by 1985"). An interim goal was "water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water . . . by July 1, 1983." *Id.* § 1251(a)(2).

70. *Watershed Assessment, Tracking & Environmental Results: National Summary of State Information*, EPA, [http://ofimpub.epa.gov/waters10/attains\\_nation\\_cy.control#STREAM/CREEK/RIVER](http://ofimpub.epa.gov/waters10/attains_nation_cy.control#STREAM/CREEK/RIVER) (last updated Sept. 22, 2013). Section 305(b) of the CWA requires each state to submit a biennial water quality report to the EPA. The report must explain which state waters are not meeting the goals of the CWA and what it would take to bring them into compliance. 33 U.S.C. § 1315(b)(1).

71. *Watershed Assessment*, *supra* note 70.

72. *Id.*

73. *Id.* Other negative findings exist for wetlands (1 percent assessed, 82 percent impaired), Great Lakes shoreline (85 percent assessed, 98 percent impaired), and Great Lakes open water (88 percent assessed, 99.88 percent impaired). *Id.*

74. *Id.*

75. *Id.*

76. Ann Powers, *The Current Controversy Regarding TMDLs: Pollutant Trading*, 4 VT. J. ENVTL. L. 9, 14 (2003).

77. 33 U.S.C. §§ 1311(a), 1342(a) (2006); 40 C.F.R. § 122.1(b) (2013).

NPDES program, in which case the state becomes the permitting authority.<sup>78</sup> (The vast majority of states have assumed the NPDES program.<sup>79</sup>) The CWA, however, does not generally regulate nonpoint source discharges.<sup>80</sup> That responsibility is left to the states, but few have aggressively pursued reductions from nonpoint source dischargers.<sup>81</sup>

NPDES permits will often set discharge limits based on what is technologically feasible<sup>82</sup>—what a power plant, for example, can achieve using technological solutions alone. Yet imposing these technology-based effluent limitations on point source discharges may not (and indeed frequently does not) result in the desired level of water quality.<sup>83</sup> This may be because of the number of point sources along the segment of a waterbody, the contribution of nonpoint source discharges and background sources of pollution, or some combination of all these factors.<sup>84</sup>

Accordingly, these technology-based standards are supplemented with water-quality-based standards.<sup>85</sup> One water-quality-based standard is total maximum daily loads (TMDLs), which are established by the states or EPA for a specific pollutant in a particular waterbody.<sup>86</sup> A TMDL is “the maximum amount of a pollutant that” may be present in a waterbody without impairing water quality.<sup>87</sup> Under CWA section 303(d), states must develop lists of all waters that are determined to be impaired, and TMDLs are required for all waters on the 303(d) list.<sup>88</sup> A TMDL assigns a waste load allocation from permitted point sources, plus load allocations from nonpoint sources and background conditions, and includes an additional allowance for a margin of safety.<sup>89</sup> To satisfy a new TMDL, a regulatory agency may reduce the amount of pollutants that a point source might otherwise be permitted to discharge under its NPDES permit, dictated by the waste load allocation portion of the

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78. 33 U.S.C. §1342(b).

79. See *National Pollutant Discharge Elimination System (NPDES): State Program Status*, EPA, <http://cfpub.epa.gov/npdes/statestats.cfm> (last updated Apr. 14, 2003).

80. *Nonpoint Source: Introduction*, EPA, <http://water.epa.gov/polwaste/nps/nonpoint1.cfm> (last updated Mar. 6, 2012); Robert L. Glicksman & Matthew R. Batzel, *Science, Politics, Law, and the Arc of the Clean Water Act: The Role of Assumptions in the Adoption of a Pollution Control Landmark*, 32 WASH. U. J.L. & POL’Y 99, 113–14 (2010).

81. See J. William Futrell, *The IUCN Sustainable Soil Project and Enforcement Failures*, 24 PACE ENVTL. L. REV. 99, 112 (2007) (stating that “the states and the EPA ignored § 303(d) [which deals with nonpoint sources] for more than twenty years”).

82. *National Pollutant Discharge Elimination System (NPDES): Water Quality and Technology-Based Permitting*, EPA, <http://cfpub.epa.gov/npdes/generalissues/watertechnology.cfm> (last updated Nov. 1, 2010).

83. ZYGMUNT J. B. PLATER ET AL., ENVIRONMENTAL LAW AND POLICY: NATURE, LAW, AND SOCIETY 524 (4th ed., 2010).

84. *Id.*

85. *National Pollutant Discharge Elimination System (NPDES): Water Quality and Technology-Based Permitting*, *supra* note 82.

86. *Impaired Waters and Total Maximum Daily Loads*, EPA, <http://water.epa.gov/lawsregs/lawsguidance/cwa/tmdl/index.cfm> (last updated Sept. 11, 2013).

87. *Id.*

88. 33 U.S.C. § 1313(d) (2006).

89. *Id.*; 40 C.F.R. § 130.2(i) (2013).

TMDL.<sup>90</sup> Because it can be costly to find additional reductions (through, for example, developing new technology or by reducing production levels), a TMDL can drive interest in water quality trading as point source dischargers search for more cost-effective compliance options to meet the waste load allocation of their more stringent NPDES permit limit.<sup>91</sup>

The EPA authorized the use of water quality trading in a 2003 policy document.<sup>92</sup> The policy primarily endorses trading involving nutrients (total phosphorous and total nitrogen) and sediments. The EPA will also consider trading of other pollutants on a case-by-case basis.<sup>93</sup> For traditional pollutants (such as total phosphorous and nitrogen), the currency is typically in pounds per year.<sup>94</sup> Other types of pollutants may require different currencies; temperature credits, for example, are measured in kcal per day.<sup>95</sup> The EPA has largely deferred to participating states regarding the details of water quality trading programs.<sup>96</sup> Therefore, the state permitting authority has the primary authority to approve the application of credits toward a NPDES permit compliance obligation.

Water quality trading can be more complicated than wetland mitigation banking or conservation banking. Trades may take place between point sources, where one point source has discharged less than its NPDES permit allows, thereby creating “credits” that can be sold to another point source that may be exceeding its permit limitations.<sup>97</sup> Such trades are reminiscent of the CAA’s cap-and-trade emissions trading program, where a utility may seek to sell unused SO<sub>2</sub> or NO<sub>x</sub> allowances.<sup>98</sup> But a point source might also wish to purchase water quality credits from a nonpoint source, such as an agricultural operation, which may be able to take a conservation action to reduce nutrient

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90. See *National Pollutant Discharge Elimination System (NPDES): Water Quality and Technology-Based Permitting*, *supra* note 82 (noting that the water-quality based effluent limits may be “more stringent”) (citing 40 C.F.R. § 122.44(d)).

91. See EPA, EPA WATER QUALITY TRADING EVALUATION: FINAL REPORT 1-1, 3-4 (2008), available at <http://water.epa.gov/type/watersheds/trading/upload/wqt.pdf> [hereinafter WATER QUALITY TRADING EVALUATION]. Note that typically dischargers cannot use water quality trading to meet a technology-based effluent limit. EPA, WATER QUALITY TRADING POLICY 6 (2003), available at [http://water.epa.gov/type/watersheds/trading/upload/2008\\_09\\_12\\_watershed\\_trading\\_finalpolicy2003.pdf](http://water.epa.gov/type/watersheds/trading/upload/2008_09_12_watershed_trading_finalpolicy2003.pdf) [hereinafter WATER QUALITY TRADING POLICY].

92. WATER QUALITY TRADING POLICY, *supra* note 91, at 2.

93. *Id.* at 4.

94. WILLAMETTE P’SHP, ECOSYSTEM CREDIT ACCOUNTING: PILOT GENERAL CREDITING PROTOCOL: WILLAMETTE BASIN VERSION 1.1, at 6 (2009), available at [http://willamettepartnership.ecosystemcredits.org/docs/General\\_Crediting\\_Protocol\\_1.1.pdf](http://willamettepartnership.ecosystemcredits.org/docs/General_Crediting_Protocol_1.1.pdf).

95. *Id.*

96. See, e.g., Letter from Bob Perciasepe, EPA Deputy Adm’r, to Alan H. Vicory, Jr., Exec. Dir., Ohio River Valley Water Sanitation Comm’n (Sept. 12, 2011) (on file with authors) (noting that “incentives [for pilot trades] must align with the Clean Water Act and are at the states’ discretion as they have been authorized by the EPA to administer the National Pollutant Discharge Elimination System program”).

97. WATER QUALITY TRADING EVALUATION, *supra* note 91, at 1-1.

98. See EPA, CAP AND TRADE: MULTI-STATE NO<sub>x</sub> PROGRAMS, available at <http://www.epa.gov/captrade/documents/nox.pdf>; *Acid Rain Program*, EPA, <http://www.epa.gov/airmarkets/progsregs/arp/basic.html> (last updated July 25, 2012).

runoff in a more cost-efficient manner.<sup>99</sup> A nonpoint source may not be operating under a permit, however, and the measurement of environmental gains (i.e., improved water quality) is challenging because a nonpoint source does not have a specific pipe from which to test.<sup>100</sup>

The timing of the environmental improvement is also an issue. Unlike wetland and conservation banking, where the impact and offset are both viewed as permanent, water quality trading focuses on discharges and offsets within a limited timeframe.<sup>101</sup> While a CWA section 404 permit contemplates the elimination of a wetland in perpetuity,<sup>102</sup> an NPDES permit will set forth discharge limits over a specified timeframe, such as a month, season, or year.<sup>103</sup> The improvements in water quality should occur immediately before or during the time period in which the credits are to be used to offset discharges.<sup>104</sup>

Another significant difference between wetland and conservation banking and water quality trading is the liability of the credit purchaser. Under wetland and conservation banking, once an entity purchases the credits (with the approval of the relevant regulatory agency), the responsibility for the offset shifts to the credit seller.<sup>105</sup> The credit purchaser no longer has any legal liability under CWA section 404<sup>106</sup> or the ESA.<sup>107</sup> Under EPA's water quality trading policy, however, a credit purchaser (i.e., a permit holder) remains liable for pollution reductions.<sup>108</sup> If the seller of water quality credits does not provide the expected environmental improvements, the regulatory agency could still require the credit purchaser to make further pollution reductions or the purchaser could even be subject to CWA penalties.<sup>109</sup>

The lack of transfer of legal liability may be one reason why water quality trading has been relatively limited.<sup>110</sup> Although trades have occurred in

99. See EPA, EPA 833-R-07-004, WATER QUALITY TRADING TOOLKIT FOR PERMIT WRITERS: WATER QUALITY TRADING SCENARIO: POINT SOURCE-NONPOINT SOURCE TRADING 1 (2009), available at [http://www.epa.gov/npdes/pubs/wqtradingtoolkit\\_ps-nps.pdf](http://www.epa.gov/npdes/pubs/wqtradingtoolkit_ps-nps.pdf).

100. *Id.* at 2; WATER QUALITY TRADING POLICY, *supra* note 91, at 9.

101. Morgan Robertson & Michael Mikota, *Water Quality Trading & Wetland Mitigation Banking: Different Problems, Different Paths?*, 29 NAT'L WETLANDS NEWSL. 9, 12 (2007); see also Mead, *supra* note 44, at 24.

102. Robertson & Mikota, *supra* note 101, at 12.

103. See *id.* (discussing the difference between permanent and temporary impairments); 40 C.F.R. § 122.45(d)(1) (2013) (requiring permits to state "[m]aximum daily and average monthly discharge limitations"); WATER QUALITY TRADING POLICY, *supra* note 91, at 8.

104. See WATER QUALITY TRADING POLICY, *supra* note 91, at 8 (stating that "[c]redits should be generated before or during the same period they are used to comply with a monthly, seasonal or annual limitation or requirement specified in an NPDES permit.").

105. See Robertson & Mikota, *supra* note 101, at 10; Gardner, *supra* note 44, at 76.

106. Robertson & Mikota, *supra* note 101, at 10.

107. Gardner, *supra* note 44, at 76.

108. Robertson & Mikota, *supra* note 101, at 10.

109. WATER QUALITY TRADING POLICY, *supra* note 91, at 10 (noting that "[i]n the event of default by another source generating credits, an NPDES permittee using those credits is responsible for complying with the effluent limitations that would apply if the trade had not occurred.").

110. WATER QUALITY TRADING EVALUATION, *supra* note 91, at 3-20.



seventeen states, many of these trades have been part of a limited program or happened on an ad hoc basis.<sup>111</sup> Only seven states have a statewide water quality trading framework in place.<sup>112</sup> Nevertheless, more states are developing statewide and regional trading frameworks. For example, statewide water quality trading programs are in development in the Chesapeake Bay region,<sup>113</sup> and the first interstate trading program was recently signed in the Ohio River basin.<sup>114</sup>

#### D. Greenhouse Gas Emissions Trading

In its most recent synthesis report in 2007, the Intergovernmental Panel on Climate Change (IPCC) found that “[w]arming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level.”<sup>115</sup> The time period of 1995 to 2006 witnessed eleven of the twelve warmest years (in terms of global surface temperature) since 1850.<sup>116</sup> Warming trends have continued, with the National Ocean and Atmospheric Administration reporting that 2012 produced the warmest twelve-month period on record for the continental United States.<sup>117</sup> The IPCC attributes most of the increase in temperature (as well as other climatic changes) to anthropogenic greenhouse gas concentrations in the atmosphere.<sup>118</sup> Because the ecological and social impacts of climate change are expected to

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111. *Water Quality Trading: State and Individual Trading Programs*, EPA, <http://water.epa.gov/type/watersheds/trading/tradingmap.cfm> (last updated Mar. 6, 2012) (spreadsheet identifying Arizona, California, Colorado, Connecticut, Delaware, Georgia, Massachusetts, Minnesota, Nevada, New Jersey, New Mexico, New York, North Carolina, Ohio, Oregon, Vermont, and Wisconsin). Note that not all of the trades have been applied toward an NPDES permit obligation. See also WATER QUALITY TRADING EVALUATION, *supra* note 91, at 3-16 to 3-21 for a discussion of perceived barriers to water quality trading.

112. *Water Quality Trading: State and Individual Trading Programs*, *supra* note 111.

113. *Chesapeake Bay TMDL: How Does It Work? Ensuring Results*, EPA, <http://www.epa.gov/reg3wapd/tmdl/ChesapeakeBay/EnsuringResults.html> (last visited Sept. 9, 2013). Food and Water Watch and Friends of the Earth recently filed a complaint against the EPA challenging the water quality trading program in the Chesapeake Bay. See Complaint, *supra* note 1.

114. See ELEC. POWER RESEARCH INST., PILOT TRADING PLAN V1.0 FOR THE OHIO RIVER BASIN WATER QUALITY TRADING PROJECT (2012), available at <http://wqt.epri.com/agreements-letters.html>.

115. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2007: SYNTHESIS REPORT 72 (Abdelkader Allali et al. eds., 2007), available at [http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4\\_syr.pdf](http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf) [hereinafter IPCC 2007 SYNTHESIS REPORT]. The next IPCC report is due out in 2014. *Fifth Assessment Report*, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, <http://www.ipcc.ch/> (last visited Sept. 22, 2013).

116. IPCC 2007 SYNTHESIS REPORT, *supra* note 115, at 30.

117. *National Overview—Annual 2012*, NAT’L OCEANIC & ATMOSPHERIC ADMIN., <http://www.ncdc.noaa.gov/sotc/national/2012/13/supplemental/page-4/> (last visited Sept. 22, 2013); see also J. Hansen et al., *Global Surface Temperature Change*, REVS. GEOPHYSICS, Dec. 14, 2010, RG4004, at 22–25 (addressing questions about perception and reality of global warming).

118. IPCC 2007 SYNTHESIS REPORT, *supra* note 115, at 39.

affect every country in the world,<sup>119</sup> the response—including the use of market mechanisms—was initially at the international level.<sup>120</sup>

The 1992 U.N. Framework Convention on Climate Change (to which the United States is a party) does not impose specified emission reductions.<sup>121</sup> However, the Kyoto Protocol does require so-called Annex I parties (primarily developed countries) to cut back on greenhouse gas emissions, up to 8 percent from 2000 levels, during the commitment period of 2008 to 2012.<sup>122</sup> To help these Annex I parties attempt to meet their obligations, the Kyoto Protocol contemplated emissions trading programs.<sup>123</sup> For example, under the Clean Development Mechanism, an Annex I party may receive credit for greenhouse gas reductions by financing a project in a developing country, including afforestation and reforestation efforts.<sup>124</sup> The United States, however, is not a party to the protocol and, as such, did not participate in trading schemes pursuant to the Kyoto Protocol.

Domestically, prospects remain remote for any comprehensive climate change legislation at the federal level.<sup>125</sup> The EPA does have authority to regulate greenhouse gases under the Clean Air Act.<sup>126</sup> The agency is proceeding with proposed regulations on emissions from vehicle tailpipes and the monitoring of large stationary sources, such as power plants, petroleum refineries, and cement production facilities.<sup>127</sup> The rulemakings may be arduous, and the final results likely will be subject to litigation.<sup>128</sup> Moreover, some members of Congress have stated their intent to strip EPA of its authority

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119. *Id.* Climate change also has national security implications. *See generally* GLOBAL CLIMATE CHANGE: NATIONAL SECURITY IMPLICATIONS (Carolyn Pumphrey ed., 2008).

120. *See* ELIZABETH KOLBERT, FIELD NOTES FROM A CATASTROPHE 148–70 (2006).

121. United Nations Framework Convention on Climate Change, May 9, 1992, 1771 U.N.T.S. 107, available at <http://unfccc.int/resource/docs/convkp/conveng.pdf>.

122. UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, KYOTO PROTOCOL REFERENCE MANUAL ON ACCOUNTING OF EMISSIONS AND ASSIGNED AMOUNT 13 (2008), available at [http://unfccc.int/resource/docs/publications/08\\_unfccc\\_kp\\_ref\\_manual.pdf](http://unfccc.int/resource/docs/publications/08_unfccc_kp_ref_manual.pdf).

123. Kyoto Protocol to the United Nations Framework Convention on Climate Change, adopted Dec. 10, 1997, 37 I.L.M. 22 (1998), available at <http://unfccc.int/resource/docs/convkp/kpeng.pdf>.

124. The U.N. Clean Development Mechanism website lists fourteen afforestation and reforestation projects. *Project Cycle Search*, UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE, <http://cdm.unfccc.int/Projects/projsearch.html> (last visited Sept. 22, 2013).

125. Richard W. Stevenson & John M. Broder, *Speech Gives Climate Goals Center Stage*, N.Y. TIMES, Jan. 21, 2013, [http://www.nytimes.com/2013/01/22/us/politics/climate-change-prominent-in-obamas-inaugural-address.html?\\_r=0](http://www.nytimes.com/2013/01/22/us/politics/climate-change-prominent-in-obamas-inaugural-address.html?_r=0) (explaining administrative actions that President Obama may take in the absence of congressional action).

126. *Massachusetts v. EPA*, 549 U.S. 497, 531 (2007).

127. *Regulatory Initiatives*, EPA, <http://www.epa.gov/climatechange/EPAactivities/regulatory-initiatives.html> (last visited Sept. 22, 2013). In a June 25, 2013 speech, President Obama outlined possible additional administrative actions. *President Obama Speaks on Climate Change*, THE WHITE HOUSE (June 25, 2013), <http://www.whitehouse.gov/photos-and-video/video/2013/06/25/president-obama-speaks-climate-change>.

128. For example, in October 2013, the U.S. Supreme Court agreed to hear *Utility Air Regulatory Group v. Environmental Protection Agency*, which challenges greenhouse gas regulations pertaining to certain stationary sources. *Coal. for Responsible Regulation v. EPA*, D.C. Cir., 684 F.3d 102, *cert. granted sub nom. Util. Air Regulatory Grp. v. EPA*, 82 U.S.L.W. 3214 (U.S. Oct. 15, 2013) (No. 12-1146).

to regulate greenhouse gases.<sup>129</sup> While U.S. markets formed in anticipation of federal rules capping greenhouse gas emissions, the lack of federal action resulted in a drop of carbon credit value from a peak of \$30 per ton of CO<sub>2</sub> equivalent to less than \$0.05.<sup>130</sup>

With no significant federal action, states have stepped in to fill the void. In 1997, Oregon placed limitations on carbon dioxide emissions from new energy facilities.<sup>131</sup> For example, a new natural-gas-fired power plant in Oregon must emit carbon dioxide at a rate that is 17 percent lower than the emission rate of the most efficient gas power plant in the country.<sup>132</sup> If an Oregon plant cannot meet this efficiency standard, it must sponsor an offset project.<sup>133</sup> California has taken a more comprehensive approach with the Global Warming Solutions Act (known as AB 32), which covers all major industries.<sup>134</sup> AB 32 includes a cap and trade program,<sup>135</sup> and an emissions source that exceeds its cap will be able to purchase offsets, even outside of California.<sup>136</sup> In November 2012, California held its first auction for carbon credits under the new program.<sup>137</sup>

Unlike wetland, species, and water quality credits, which are designed to offset local impacts (e.g., within a watershed, range, or segment), greenhouse gas credits are intended to offset concentrations at the global scale. Carbon dioxide emissions generally do not degrade local air quality, and a carbon offset from California is thought to have the same impact on the climate system as an offset from Arizona (or India). Accordingly, several groups of states have banded together to establish regional trading regimes: the Regional Greenhouse Gas Initiative,<sup>138</sup> the Western Climate Initiative,<sup>139</sup> and the Midwestern

129. John M. Broder, *House Panel Votes to Strip E.P.A. of Power to Regulate Greenhouse Gases*, N.Y. TIMES, Mar. 10, 2011, [http://www.nytimes.com/2011/03/11/science/earth/11climate.html?\\_r=0](http://www.nytimes.com/2011/03/11/science/earth/11climate.html?_r=0).

130. See Anthony Watts, *US Carbon Trading—Not Worth a Plug Nickel*, WATTS UP WITH THAT? (Oct. 26, 2010), <http://wattsupwiththat.com/2010/10/26/us-carbon-trading-not-worth-a-plug-nickel/> (noting that the “price on a ton of carbon” was \$0.05 on October 25, 2010).

131. ENVTL. DEF. FUND, STATES HAVE LED THE WAY IN CURBING CARBON POLLUTION FROM NEW POWER PLANTS (2012), available at [http://www.edf.org/sites/default/files/State\\_GHG\\_standards\\_3-13-2012.pdf](http://www.edf.org/sites/default/files/State_GHG_standards_3-13-2012.pdf); see also *State and Local Climate and Energy Program: Oregon*, EPA, <http://www.epa.gov/statelocalclimate/state/tracking/individual/or.html> (last updated Aug. 6, 2013).

132. ENVTL. DEF. FUND, *supra* note 131; *State and Local Climate and Energy Program: Oregon*, *supra* note 131.

133. *State and Local Climate and Energy Program: Oregon*, *supra* note 131. A plant can also make a “donation to the Climate Trust Fund.” *Id.*

134. See *State and Local Climate and Energy Program: California*, EPA, <http://www.epa.gov/statelocalclimate/state/tracking/individual/ca.html> (last updated Aug. 6, 2013) (briefly discussing AB 32).

135. *Id.*

136. *Cap-and-Trade Program*, CAL. AIR RESOURCES BOARD, <http://www.arb.ca.gov/cc/capandtrade/capandtrade.htm> (last visited Sept. 20, 2013); CAL. EPA, JANUARY 2013 STATE AGENCY GREENHOUSE GAS REDUCTION REPORT CARD 4 tbl.2, available at [http://www.climatechange.ca.gov/climate\\_action\\_team/reports/2013\\_CalEPA\\_Report\\_Card.pdf](http://www.climatechange.ca.gov/climate_action_team/reports/2013_CalEPA_Report_Card.pdf) [hereinafter CAL. EPA, REPORT CARD].

137. CAL. EPA, REPORT CARD, *supra* note 136, at 4 tbl.2. In January 2013, the program also survived the first legal challenge about how additionality is calculated. *Citizens Climate Lobby v. Cal. Air Res. Bd.*, No. CGC-12-519554, 2013 WL 861396 (Cal. Super. Ct. Jan. 25, 2013).

138. For more information about the Regional Greenhouse Gas Initiative, see REGIONAL GREENHOUSE GAS INITIATIVE, <http://www.rggi.org/> (last visited Sept. 22, 2013).

Regional Greenhouse Gas Reduction Accord.<sup>140</sup> Common features to these programs are caps on greenhouse gas emissions and transboundary trading. Because there are numerous greenhouse gases, the offset credits are typically translated into tons of carbon dioxide equivalents. Expanding the trading area and equalizing credits into a common accounting unit provides more flexibility to emission sources to locate cost-effective offsets and may result in a more robust market by increasing the number of buyers and sellers.

Thus, in the United States, because of a lack of federal initiative, the drivers for greenhouse gas or carbon sequestration credits are state cap-and-trade programs. However, these state programs (that sometimes operate under a regional framework) are in relatively early stages of development.

#### *E. Summary of Environmental Credit Markets*

Although all of the environmental credit markets discussed involve some type of payment for environmental offsets, each varies significantly in terms of legal framework, regulatory agencies, level of government (federal and/or state), the method by which the credits are produced, and the method by which the credits are measured. Table 1 highlights these differences.

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139. For more information about the Western Climate Initiative, see W. CLIMATE INITIATIVE, <http://www.westernclimateinitiative.org/> (last visited Sept. 22, 2013).

140. For more information about the Midwestern Regional Greenhouse Gas Reduction Accord, see *Midwest Greenhouse Gas Reduction Accord*, CENTER FOR CLIMATE & ENERGY SOLUTIONS, <http://www.c2es.org/us-states-regions/regional-climate-initiatives/mggra> (last visited Feb. 19, 2013).

**TABLE 1: SUMMARY OF ENVIRONMENTAL CREDIT MARKETS IN THE UNITED STATES.**<sup>141</sup>

	<b>Wetlands and Streams</b>	<b>Endangered Species</b>	<b>Water Quality</b>	<b>Carbon</b>
<b>Underlying U.S. Federal Laws Driving Markets</b>	Clean Water Act (§404).	Endangered Species Act (§7, §10).	Clean Water Act (§303).	Currently none. (Possibly in the future under the Clean Air Act, if greenhouse gas trading is allowed).
<b>Federal Regulations, Policies, and Guidance for Environmental Credit Markets</b>	Compensatory Mitigation for Loss of Aquatic Resources (Corps and EPA regulation).	Federal Guidance for the Establishment, Use, and Operation of Conservation Banks (FWS). Guidance for the Review, Establishment, Use and Operation of Conservation Banks and In-Lieu Fee Mitigation Programs (NMFS Southwest Region).	EPA Water Quality Trading Policy.	Currently none.
<b>State Laws, Regulations, Policies, and Guidance for Environmental Credit Markets (examples)</b>	At least thirty-one states have wetland mitigation laws, regulations, and/or policies.	California Fish and Game Code California Official Policy on Conservation Banks (prior to 2013).	Seven statewide trading frameworks in place (OR, ID, CO, MI, OH, PA, VT) with an additional four in development (MN, FL, WV, MD).	California Global Warming Solutions Act of 2006 (AB 32) Oregon Carbon Dioxide Standard of 1997 (H.B. 3283) Regional Greenhouse Gas Initiative.
<b>Commodity (Credit Currency)</b>	A functional or areal measure (such as <b>acres</b> of wetlands) representing the accrual or attainment of aquatic functions at a compensatory mitigation site.	<b>Acres</b> of habitat and/or numbers of <b>breeding pairs</b> representing the quantification of species or habitat conservation values within a conservation bank.	<b>Pounds</b> of nutrient reductions (e.g., total phosphorus and total nitrogen) or sediment loads. Other pollutants on a case-by-case basis.	Offset credits typically represent <b>short tons</b> or <b>metric tons (tonnes)</b> of carbon dioxide equivalent (tCO <sub>2</sub> e) reductions.
<b>Credit Price Range</b>	\$3000–\$653,000	\$2500–\$300,000	\$1.21–\$10 (lb annual nitrogen) \$3.76–\$25.16 (lb annual phosphorous)	\$1.89–\$3.52 (RGGI 2008-2011)
<b>Total Annual Market Value</b>	\$1.8–\$3.2 billion	\$200 million	\$10.8 million	\$249 million (RGGI 2011)

141. Adapted and updated from Jessica Fox, Royal C. Gardner & Todd Maki, *Stacking Opportunities and Risks in Environmental Credit Markets*, [2010] 41 Env'tl. L. Rep. (Env'tl. Law Inst.) 10,121, and Becca Madsen, Jessica Fox & Adam Diamant, Elec. Power Research Inst., Offset Credit Stacking (Nov. 2012) (background paper for the Electric Power Research Institute Greenhouse Gas Emissions Offset Policy Dialogue Workshop #13), available at [http://eea.epri.com/pdf/ghg-offset-policy-dialogue/workshop13/Background-Paper\\_EPRI-Offsets-W13\\_Credit-Stacking\\_Final\\_Locked.pdf](http://eea.epri.com/pdf/ghg-offset-policy-dialogue/workshop13/Background-Paper_EPRI-Offsets-W13_Credit-Stacking_Final_Locked.pdf).

While the Corps has the lead for wetland mitigation banking, FWS and NMFS have primary responsibility for conservation banking. EPA and the states oversee water quality trading, and greenhouse gas trading is currently a state-regulated activity. In addition, agencies that represent stakeholders or possible market participants, such as the U.S. Department of Agriculture (USDA), also play a role.<sup>142</sup> With respect to producing credits, the Corps prefers wetland restoration, FWS favors preservation of species habitat, and water quality improvements and greenhouse gas reductions can occur through a myriad of practices. The credits themselves may be measured in terms of area, function, individual animals, pounds, or tons.

Obviously, these variations can complicate efforts to sell stacked credits in multiple markets. An initial question, however, is whether credit stacking should be permitted at all. While selling credits in multiple markets may be beneficial to a credit producer (multiple revenue streams for the same conservation activity) and to credit purchasers (possibly more cost-effective credits), is it ecologically justifiable to parse out suites of ecosystem functions that are inextricably linked? The next section examines different stacking scenarios and how regulatory agencies have treated them.

## II. THE PRACTICE OF CREDIT STACKING

In a 2010 study, we conducted a national survey on credit stacking, reaching out to approximately 1500 environmental credit market practitioners to collect opinions, current research, and examples of stacking in the United States.<sup>143</sup> After verification and removal of duplicate inputs, we received responses from 309 individuals for an estimated 20 percent response rate. Respondents self-identified along the following categories: credit sellers (117), researchers (89), policy makers (82), credit buyers (17), and credit exchanges (4).<sup>144</sup> The consensus definition of credit stacking, derived from the survey respondent, is the establishment of “more than one credit type on spatially overlapping areas, i.e., in the same acre.”<sup>145</sup> Figure 1 provides several possible stacking scenarios.

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142. USDA often pays farmers to take environmentally beneficial actions that could potentially produce environmental credits. *See supra* note 11 and accompanying text (discussing the Conservation Reserve Program and the Wetlands Reserve Program); Fox, Gardner & Maki, *supra* note 141, at 10,123.

143. Fox, Gardner & Maki, *supra* note 141.

144. *Id.* at 10,122.

145. *Id.*

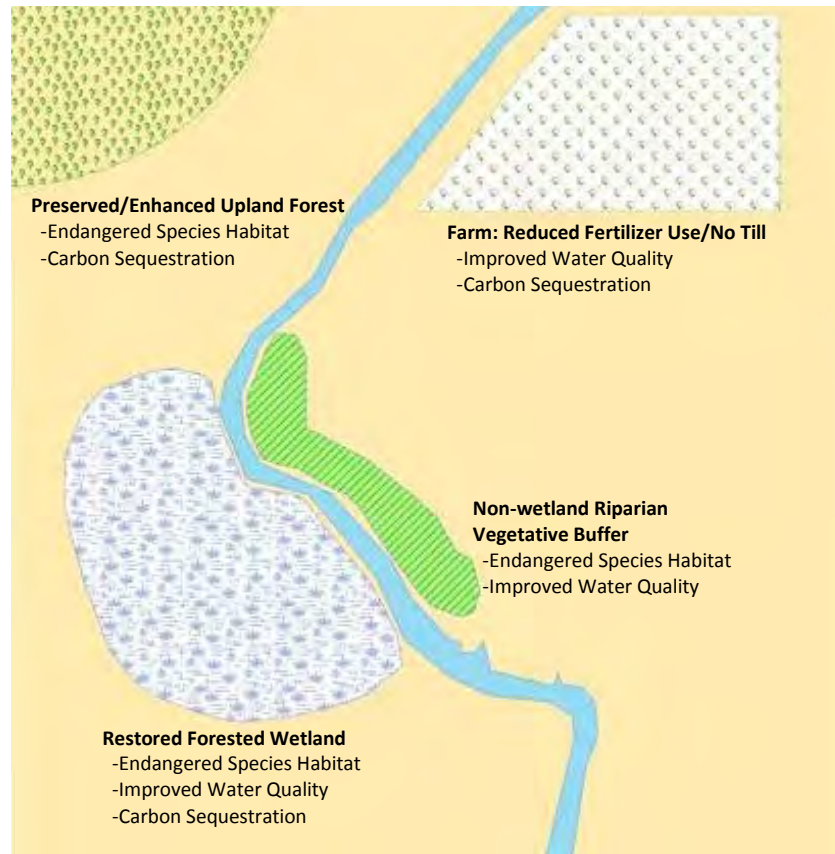


FIGURE 1: POSSIBLE STACKING SCENARIOS.

We found that producing stacked credits for multiple markets using one conservation action is not itself controversial; rather, it is the resulting transactions—the sale or transfer of the stacked credits—that can be contentious. Gillenwater (Figure 2) provides a very useful construct for framing the issue. The key question is whether it is appropriate to unbundle stacked credits and sell them in different markets to offset impacts from multiple activities. In the view of many survey respondents, the answer often turns on whether a particular credit-producing activity is deemed to be “additional.”<sup>146</sup> *Additionality* means that the activity goes beyond “business as usual.”<sup>147</sup> However, determining the proper baseline from which to measure

146. Madsen, Fox & Diamant, *supra* note 141, at 12–13.

147. *Id.* at 12. Gillenwater describes an activity as “*additional* if the recognized policy interventions are deemed to be causing the activity to take place. The occurrence of additionality is determined by assessing whether a proposed activity is distinct from its baseline . . . .” MICHAEL GILLENWATER, GREENHOUSE GAS MGMT. INST., DISCUSSION PAPER NO. 003, WHAT IS ADDITIONALITY? PART 3: IMPLICATIONS FOR STACKING AND UNBUNDLING 4 (2012), available at [http://ghginstitute.org/wp-content/uploads/content/GHGMI/AdditionalityPaper\\_Part-3\(ver3\)FINAL.pdf](http://ghginstitute.org/wp-content/uploads/content/GHGMI/AdditionalityPaper_Part-3(ver3)FINAL.pdf).

environmental gains (i.e., improvements beyond business as usual or the status quo) for purposes of additionality can be complicated.<sup>148</sup>

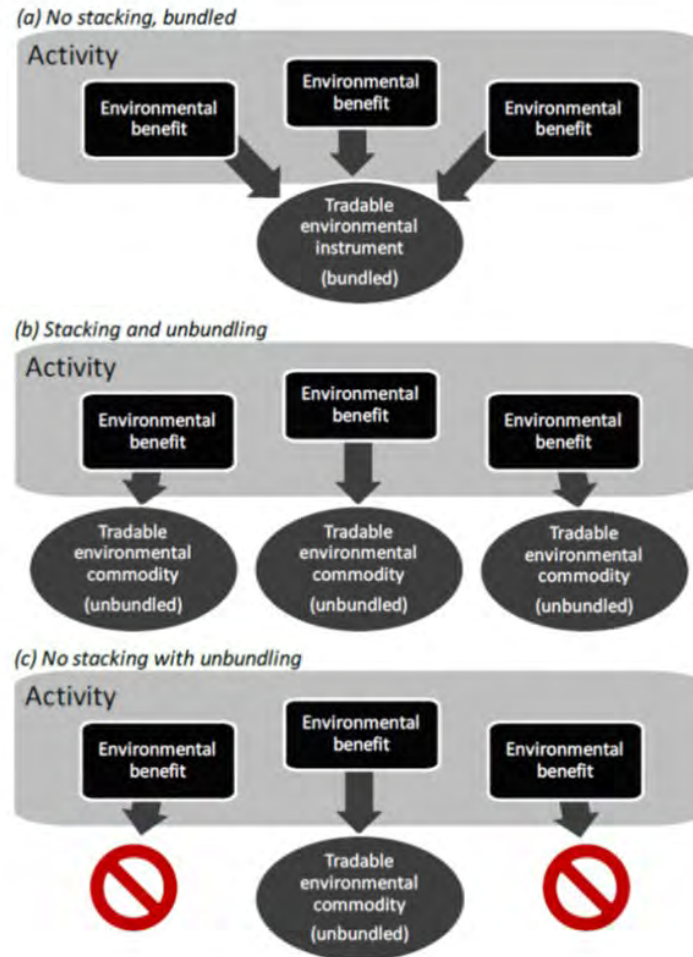


FIGURE 2: STACKING AND BUNDLING CONFIGURATIONS FOR A SINGLE ACTIVITY.<sup>149</sup>

Before examining specific examples of credit stacking, it is important to distinguish credit stacking from *payment stacking* and *multi-use* of a conservation area. *Payment stacking* refers to a project that receives two or more payments for the same conservation action, at least one of which was

148. Madsen, Fox & Diamant, *supra* note 141, at 13 (identifying eight different tests for additionality).

149. Reprinted from GILLENWATER, *supra* note 147.



government funded.<sup>150</sup> For example, a farmer might be paid by the USDA through the Wetlands Reserve Program or the Conservation Reserve Program to take certain conservation actions to improve wildlife habitat. If these actions generated environmental credits that the farmer then sells, the farmer would be engaged in payment stacking, having received payment from both the USDA and a credit purchaser. While the farmer would benefit from the multiple revenue streams, taxpayers and environmental advocates may object since public dollars are generally intended to advance conservation, rather than offset private-sector impacts.<sup>151</sup>

*Multi-use* of a conservation area refers to “[u]sing a property for multiple compatible uses.”<sup>152</sup> This multi-use can also generate additional revenue, but is not directly related to the production of environmental credits. For example, with the authorization of the Corps and the Oregon Department of State Lands, the Mud Slough Wetland Bank charges a fee to bird hunters who hunt on the site.<sup>153</sup> The Kern Water Bank in California’s southern San Joaquin Valley presents an interesting multi-use scenario. The 20,000-acre site’s underground reservoir is used to store water supplies for agricultural and residential purposes.<sup>154</sup> On the surface, part of the site is managed as a conservation bank, which generates credits for the San Joaquin Valley kit fox, Tipton kangaroo rat, and blunt-nosed leopard lizard.<sup>155</sup>

In contrast to these definitions, *credit stacking* is generating multiple mitigation credit types on the same parcel of land (i.e., the same acre).<sup>156</sup> As

150. WORLD RES. INST., WRI FACT SHEET: STACKING PAYMENTS FOR ECOSYSTEM SERVICES 1 (2009), available at [http://pdf.wri.org/factsheets/factsheet\\_stacking\\_payments\\_for\\_ecosystem\\_services.pdf](http://pdf.wri.org/factsheets/factsheet_stacking_payments_for_ecosystem_services.pdf).

151. As we noted previously:

Rules governing the private use of credits produced with federal funds are not entirely consistent. The USDA Conservation Reserve Program (CRP), which pays farmers to install conservation practices, allows for “the sale of carbon, water quality, or other environmental credits” insofar as those sales are “consistent with the soil, water, and wildlife conservation purposes of the program.” USDA’s Wetlands Reserve Program (WRP) and Environmental Quality Incentives Program have similar provisions. In contrast, the United States Army Corps of Engineers (USACE) and USEPA have issued a regulation that precludes the use of CRP or WRP monies to generate wetland credits. Similarly, USFWS Guidance for Conservation Banking provides that lands (including agricultural lands) that have been protected or restored through other federal programs are generally not eligible to produce species credits.

Fox, Gardner & Maki, *supra* note 141, at 10, 123.

152. Jessica Fox, *Getting Two for One: Opportunities and Challenges in Credit Stacking*, in CONSERVATION & BIODIVERSITY BANKING: A GUIDE TO SETTING UP AND RUNNING BIODIVERSITY CREDIT TRADING SYSTEMS, *supra* note 44, at 171, 173.

153. MUD SLOUGH WETLAND MITIGATION BANK, MITIGATION BANK FINAL INSTRUMENT 9 (2000), available at [http://www.eli.org/pdf/wmb/OR.WMB.Mud\\_Slough\\_Wetland\\_Mitigation\\_Bank.pdf](http://www.eli.org/pdf/wmb/OR.WMB.Mud_Slough_Wetland_Mitigation_Bank.pdf).

154. *The Kern Water Bank: Dual Purpose*, KERN WATER BANK AUTH., <http://www.kwb.org/> (last visited Feb. 19, 2013).

155. *Id.*; *United States Search Results for Banks*, SPECIESBANKING.COM, <http://us.speciesbanking.com/pages/dynamic/banks.search.php> (last visited Feb. 24, 2013).

156. The concept of credit stacking is susceptible to multiple definitions. For example, Cooley and Olander divide stacking into horizontal stacking, vertical stacking, and temporal stacking, although they

noted above, if the stacked credits are *unbundled*, they may be sold in different credit markets to offset impacts from different activities, thereby raising concerns about additionality. With these distinctions in mind, let us now examine specific examples of credit stacking and the rules that govern the use of these stacked credits. The information below was gathered largely through the 2010 national survey on credit stacking discussed above. The survey responses and follow-up research identified dozens of instances of projects with stacked credits, but yielded only a few examples where the stacked credits were unbundled and sold in different environmental markets to offset multiple activities.

A. *Multi-Species Conservation Banks (Federal Species Only)*

One example of stacked credits involves conservation banks that produce credits for two or more endangered or threatened species. Note, however, that some practitioners do not view multi-species conservation banks as credit stacking because the credits are not sold in different markets. In one sense a conservation bank that has overlapping Florida scrub jay and sand skink habitat produces just one type of credit—species credits—and these credits can only be used to offset ESA-related impacts. On the other hand, such a bank does establish more than one type of species credit on spatially overlapping areas: a scrub jay credit and a sand skink credit. These credits are not interchangeable, and it is instructive to consider how the agencies treat requests to unbundle such credits.

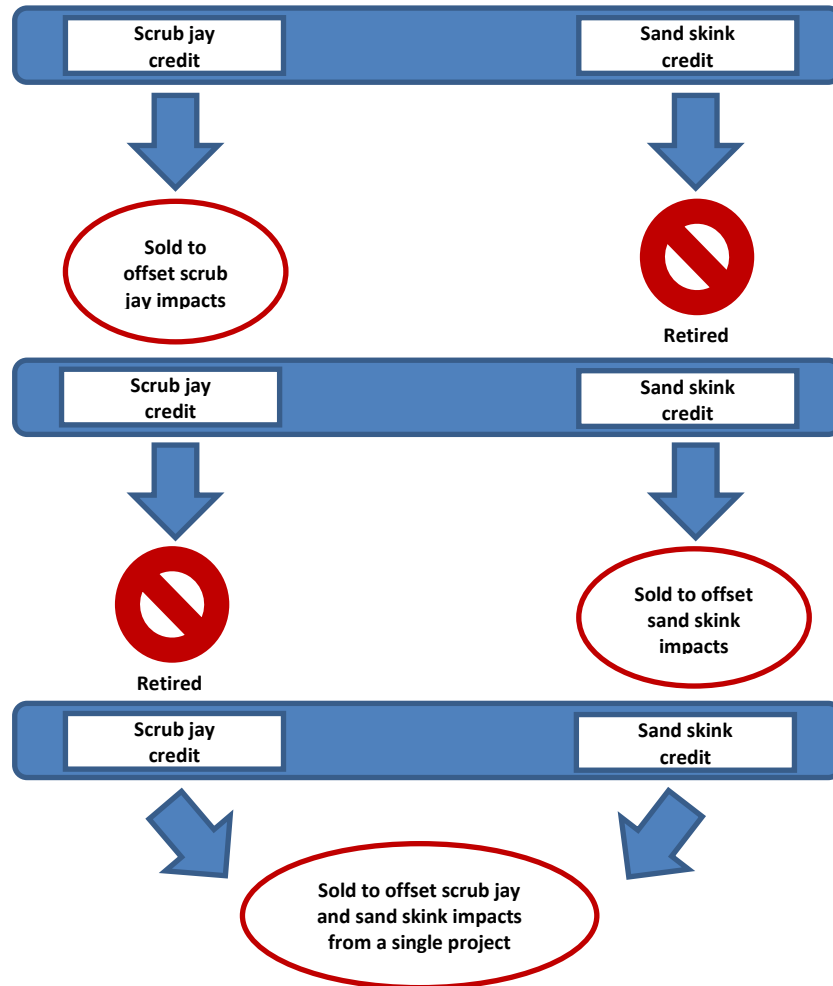
The general rule is that the FWS will *not* permit stacked species credits to be unbundled and sold separately to offset different development projects.<sup>157</sup> Thus, if one acre of a conservation bank generates a scrub jay credit and a sand skink credit, there are three permissible scenarios. First, the banker may sell a scrub jay credit to a developer who only needs to offset impacts to scrub jays. When this transaction occurs, the parcel is effectively retired from the ESA market; the sand skink credit may no longer be used. The second scenario is the same as the first, but the developer only needs to purchase a sand skink credit, in which case the scrub jay credit is retired. The third scenario is where the developer is taking action on one acre that requires it to offset both scrub jay

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acknowledge that horizontal stacking (credits “on non-spatially overlapping areas”) “may not be considered true stacking.” David Cooley & Lydia Olander, *Stacking Ecosystem Services Payments: Risks and Solutions*, [2012] 42 ENVTL. L. REP. (Envtl. Law Inst.) 10,150, 10,156. The definition we use in this Article encompasses vertical and temporal stacking.

157. Memorandum from the U.S. Fish & Wildlife Serv., *supra* note 60, at 9 (“In some instances a bank may contain habitat that is suitable for multiple listed species. When this occurs, it is important to establish how the credits will be divided. For instance, once a project buys a credit for one species, that credit cannot be sold again for another species. If the proposed project impacts multiple species and the bank contains the same multiple species, then the credits can be sold for in-kind replacement. As a general rule, overlapping multiple species credits can overlap for a single project, but not multiple projects.”).

and sand skink impacts. In this case, the banker may then sell both credits to the developer (Figure 3).



**FIGURE 3: CREDIT TRANSACTION SCENARIOS FOR SCRUB JAY AND SAND SKINK CREDITS.**

With more than two species, credit calculations can become more complicated. For example, the Ohlone Preserve Conservation Bank in Alameda County, California, is a 640-acre site that offers credits for the California red-legged frog (CRLF), the Alameda whipsnake (AWS) and the California tiger salamander (CTS), the last of which is further divided into salamander breeding habitat and upland habitat.<sup>158</sup> An additional level of complexity is that the

158. THE CONSERVATION FUND, CASE STUDY SERIES: THE OHLONE PRESERVE CONSERVATION BANK 1 (2010), available at <http://www.conservationfund.org/our-conservation-strategy/major-programs/conservation-leadership-network/cln-resources/mitigation-resources/conservation-banking-case-studies/> (follow “#8 Ohlone Preserve Conservation Bank” hyperlink).

credit determinations for the species vary. FWS assigns AWS and CTS credits on a 1:1 ratio; for each acre of habitat preserved, one credit may be generated.<sup>159</sup> In contrast, FWS bases CRLF credits on a 1:1.667 ratio; for each acre preserved, 1.667 credits may be available.<sup>160</sup> Nevertheless, the general prohibition on unbundling stacked credits and selling them separately is still applicable:

When an acre of habitat is used by only one species, it is only available for impacts to that species. But when an acre of habitat is occupied by more than one species, it is available for either species, or as a multi-species acre for impacts to habitat that affects the same combination of species. When a multi-species acre is used for a single species, the other species credits will be debited accordingly. For example, a sale of 10 AWS credits from an area that overlaps with CRLF credits will reduce the number of AWS credits by 10 and the CRLF credits by 16.670 (10 x 1.667). Alternatively, a sale of 10 CRLF credits from an area that overlaps with AWS credits will reduce the number of CRLF credits by 10 and the number of AWS credits by 6 (10 ÷ 1.667).<sup>161</sup>

Table 2 illustrates the various combinations of credit transactions.

**TABLE 2: CREDIT CALCULATIONS FOR STACKED SPECIES CREDITS.**

Type of Credit*	Number of Acres of Habitat	Number of Credits**
<b>CRF only</b>	33.1	55.3
<b>AWS only</b>	2.3	2.3
<b>CTSU only</b>	0.7	0.7
<b>Multi-species CRF or CTSB***</b>	0.5	0.8 CFR or 0.5 CTSB
<b>Multi-species CFR or CTSU</b>	370.0	616.8 CFR or 370.0 CTSU
<b>Multi-species CFR or AWS</b>	184.9	308.2 CFR or 184.9 AWS
<b>Multi-species CFR, CTSU, or AWS</b>	47.0	78.3 CFR or 47.0 CTSU or 47.0 AWS

\*KEY: CFR = California red-legged frog, AWS = Alameda whipsnake, CTSB = California tiger salamander breeding site habitat, CTSU = California tiger salamander upland habitat

\*\*Number of credits for CFR is based on the Bank Value of 1.667 (see the CFR Credit Determination for an explanation of Bank Value) meaning 1 acre of habitat = 1.667 credits. The number of credits for AW, CTSB, and CTSU are based on 1 acre of habitat = 1 credit.

\*\*\*There are three CTS breeding sites with a total acreage of 0.5 acres.

The concern with unbundling stacked credits and selling them separately is rather apparent. If an acre of land produced one CTS credit, one AWS credit, and 1.67 CRLF credits, the unbundled credits could be used to offset three separate development projects. If the mitigation ratio were 1:1 (one credit required for each acre of impact), the end result would be the loss of three acres of habitat in exchange for a single acre in the bank. In such a scenario, the conservation banker would essentially be selling the same acre more than once

159. *Id.* at 3.

160. *Id.*

161. *Id.*

for no additional conservation benefit. Accordingly, FWS generally prohibits this practice because of a lack of additionality.<sup>162</sup>

*B. Multi-Species Conservation Banks (Federal and State Species)*

Our research did identify one example of a single parcel that effectively generates two different types of species credits that are used to offset impacts from multiple projects. The mitigation park at Lyonia Preserve in Volusia County, Florida, is used to offset impacts to the Florida scrub jay, which is listed as threatened under both federal and state law, and the gopher tortoise, which in Florida is protected only under state law.<sup>163</sup> While not a formal conservation bank, Lyonia Preserve does illustrate that the FWS and state agencies will permit, under certain circumstances, the same acre of land to be used to offset development impacts from different projects. One key element to such an arrangement is that different actions are taken to produce the different credits, thus alleviating some of the additionality concerns.

For Florida scrub jay purposes, a 2004 memorandum of understanding that Volusia County and the County School Board entered into with the FWS governs Lyonia Preserve.<sup>164</sup> The site is used to offset Florida scrub jay impacts from county public works and school projects at a 2:1 or 3:1 ratio, depending on whether the habitat is occupied by the species.<sup>165</sup> Lyonia Preserve is also used, however, as a recipient site to offset impacts to gopher tortoises.<sup>166</sup> When a county project is expected to result in the destruction of gopher tortoise habitat and the death of identifiable individual tortoises, those individuals are relocated to Lyonia Preserve.

The site can thus be seen as an example of stacking: the same acre is being used to satisfy compensation requirements under different regulatory regimes. In such a case there is a loss of overall habitat. However, there are several reasons why this scenario is permitted. First, there is additionality, literally; a gopher tortoise is introduced and added to the site. Moreover, the metric for each species is different. For the scrub jay, the metric is based primarily on area of habitat, while the metric for the gopher tortoise is a live individual. Finally,

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162. The FWS's conservation banking guidance states:

Land used to establish conservation banks must not be previously designated for conservation purposes (e.g., parks, green spaces, municipal watershed lands), unless the proposed designation as a bank would add additional conservation benefit. For instance, it may be advantageous to place in a conservation bank the biological and habitat benefits that a species has gained under a Safe Harbor Agreement, where the landowner would agree to maintain those resource values in perpetuity.

Memorandum from the U.S. Fish & Wildlife Serv., *supra* note 60, at 6.

163. Memorandum of Understanding between the Cnty. of Volusia, Fla., Sch. Bd. of Volusia Cnty., Fla. & U.S. Fish & Wildlife Serv. (June 1, 2004) (on file with authors); Liz Brennan, *Protecting Creatures Great and Small in Volusia*, HOMETOWN NEWS (July 20, 2006), <http://www.myhometownnews.net/index.php?id=11931>.

164. Memorandum of Understanding, *supra* note 163.

165. *Id.*

166. Brennan, *supra* note 163.

the land can be managed for the benefit of both species, and there is transparency because all the relevant agencies are aware of the dual use of the site.

*C. Stacking Wetland and Endangered Species Credits*

A commonly cited example of stacked credits occurs where a wetland mitigation bank also has species credits (or where a conservation bank also has wetland credits). In such a case, the Corps and FWS do not permit the credits to be unbundled to offset multiple projects. Van Vleck Ranch Mitigation Bank, a 765-acre site in Sacramento County, California, demonstrates this point.<sup>167</sup>

Pursuant to a 2009 bank enabling instrument signed by the Corps, FWS, and California Department of Fish and Wildlife, the bank offers credits based on preserved upland grasslands and vernal pool preservation and creation.<sup>168</sup> All credits are based on a 1:1 acreage ratio.<sup>169</sup> The grasslands may generate up to 722 credits for the Swainson's hawk (listed as threatened under California's ESA).<sup>170</sup> The preserved vernal pools may produce up to 27 credits for the federally threatened fairy shrimp, and the created vernal pools (if performance criteria are met) may yield up to 16 credits.<sup>171</sup> The grasslands, preserved vernal pools, and created vernal pools do not spatially overlap; thus, these credits are not stacked. However, the credits related to vernal pool creation may be used to offset impacts to fairy shrimp under the ESA *or* they may be used to offset wetland impacts under the CWA.<sup>172</sup> These 16 acres have produced, with the concurrence of the relevant federal agencies, stacked credits.

Yet the agencies, through the bank enabling instrument, are very clear that these stacked credits may not be unbundled and sold separately.<sup>173</sup> These overlapping credits, which represent acres, cannot be unbundled and sold first for species mitigation and then for wetland mitigation, or vice versa. Accordingly, once the species or wetland credit associated with a particular parcel is sold (separately or jointly to offset the impacts of a single project), that parcel is effectively retired from the mitigation markets.<sup>174</sup> Such an approach is consistent with the 2008 Corps-EPA regulation on compensatory

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167. THE CONSERVATION FUND, CASE STUDY SERIES: THE VAN VLECK RANCH MITIGATION BANK (2010), *available at* <http://www.conservationfund.org/our-conservation-strategy/major-programs/conservation-leadership-network/cln-resources/mitigation-resources/conservation-banking-case-studies/> (follow "#12 Van Vleck Ranch Mitigation Bank" hyperlink).

168. *Id.* at 2.

169. *Id.* at 3.

170. *Id.*

171. *Id.* at 1–2. "Additionally, 16.24 acres of vernal pools and swales were created within the natural topography of the site and inoculated with seeds and cysts from the existing wetland resources on the site to establish viability." *Id.*

172. *Id.* at 3.

173. *Id.* at 1, 3.

174. See Valerie Layne, *Layering Multiple Credit Types in Mitigation Banks*, NAT'L WETLANDS NEWSL., Jan.–Feb. 2011, at 8, 8–9 (explaining the treatment of banks with CWA and ESA credits in California).

mitigation for impacts to aquatic resources, which states that “[u]nder no circumstances may the same credits be used to provide mitigation for more than one permitted activity.”<sup>175</sup>

The agencies will not permit unbundling of stacked credits in this situation because the wetland credits already take into account habitat and wildlife values, which makes sense from both an ecological and legal perspective. As an ecological matter, a primary function of many wetlands is to provide habitat for endangered species. As a legal matter, the CWA (despite its title) is also a wildlife protection statute. Congress has expressly stated that the permitting criteria for a CWA section 404 permit must include consideration of impacts to fish, shellfish, and wildlife.<sup>176</sup> Allowing a restored acre of wetlands to be sold to offset separate wetland and endangered species impacts would amount to selling the same natural resource offset twice.<sup>177</sup>

#### *D. Stacking Wetland and Water Quality Credits*

The survey highlighted one project where stacked wetland and water quality credits had been sold in different markets to offset impacts from multiple projects. In 2000, the federal government (through the Corps) authorized Environmental Banc and Exchange (EBX) to sell wetland credits based on restoration and preservation actions taken at the Neu-Con Umbrella Wetland Mitigation and Stream Restoration Bank, which is located on various sites along the Neuse River in North Carolina.<sup>178</sup> EBX then sold approximately 250 wetland credits from the three bank sites to the North Carolina Department of Transportation for \$3.8 million.<sup>179</sup> Eight years later, EBX applied to the North Carolina Division of Water Quality (DWQ) for certification of nutrient offset (water quality) credits.<sup>180</sup> DWQ certified the nutrient offset credits, which arose from the same parcels that had provided wetland credits.<sup>181</sup> Because “there were no rules that directly addressed the issue,” DWQ decided that wetland mitigation banks “also could be used to generate nutrient offset

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175. 40 C.F.R. § 230.93(j)(1)(ii) (2013).

176. The Corps is required to make permit decisions in accordance with the EPA’s CWA section 404(b)(1) guidelines. 33 U.S.C. § 1344(b)(1) (2006). Congress stated that the EPA’s guidelines “shall be based upon criteria comparable to the criteria applicable to the territorial seas, the contiguous zone, and the ocean under section 1343(c).” *Id.* The CWA section 403(c) criteria include effects on “fish, shellfish, [and] wildlife.” *Id.* § 1343(c). Moreover, the EPA may veto permits based on unacceptable impacts to fish, shellfish, and wildlife. *Id.* § 1344(c).

177. To be fair, one can conceive of a situation where a wetland’s specific functions (such as flood control and species habitat) are separately accounted for and unbundled. *See infra* note 186 and accompanying text (discussing the Corps Galveston District’s use of a hydrogeomorphic approach in assessing wetland gains and losses).

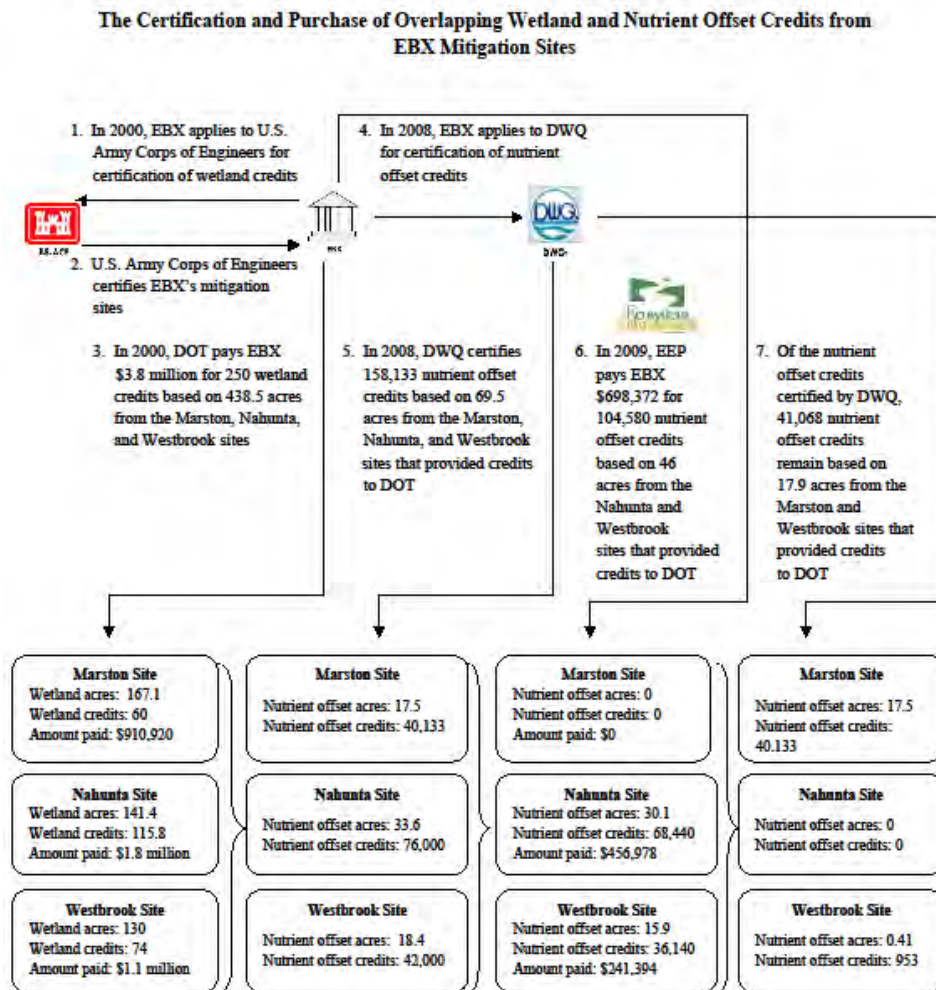
178. N.C. GEN. ASSEMBLY, PROGRAM EVALUATION DIV., DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES MITIGATION CREDIT DETERMINATIONS: SPECIAL REPORT TO THE GENERAL ASSEMBLY, REP. NO. 2009-04, 6 (2009), available at [http://www.ncleg.net/PED/Reports/documents/Wetlands/Wetland\\_Report.pdf](http://www.ncleg.net/PED/Reports/documents/Wetlands/Wetland_Report.pdf).

179. *Id.* at 8.

180. *Id.* at 7.

181. *Id.*

credits.”<sup>182</sup> In 2009, EBX sold a majority of the nutrient offset credits to the North Carolina Ecosystem Enhancement Program to offset impacts from transportation development for almost \$700,000.<sup>183</sup> Figure 4 provides a timeline and illustrates the area that produced overlapping credits.



Notes: Calculations for credits vary by the type of credit, but the number of acres to derive credits is constant. DOT paid a total of \$7.1 million to EBX for wetland credits, \$3.8 million of which was based on credits that overlapped with EEP's 2009 purchase of nutrient offset credits.

Source: Program Evaluation Division based on data from the Division of Water Quality and the Ecosystem Enhancement Program.

**FIGURE 4. UNBUNDLING WETLAND AND NUTRIENT OFFSET CREDITS.**

182. *Id.*

183. *Id.* at 8.



This project implicates some of the same concerns as the wetland-species stacking scenario. The water quality function is intrinsic to most wetlands. A report by the North Carolina Program Evaluation Division concluded that “[t]he actual and potential loss incurred by certifying nutrient offset credits that overlap wetland credits already allotted comprise a net loss to North Carolina’s environment.”<sup>184</sup> Criticized as “double dipping,” the transaction led North Carolina to place a moratorium on certifying nutrient offset credits on land previously used to produce wetland credits.<sup>185</sup>

It is possible, however, to unbundle individual wetland functions. Indeed, some Corps districts use a hydrogeomorphic approach to assess wetland impacts and offsets. In the Galveston District, for example, the Spellbottom Mitigation Bank can produce three different types of functional credits: temporary storage of surface water; maintenance of plant and animal communities; and removal and sequestration of elements and compounds.<sup>186</sup> Because these functional credits arise from the same area, they may properly be viewed as stacked credits. Nevertheless, the mitigation banking instrument states that “[c]redits must be traded as a suite of functions,”<sup>187</sup> which appears to preclude unbundling the credits and using them to offset different development projects. Even if the Corps allowed the unbundling of individual wetland functions, a separate question (and concern) is whether the agency has the capacity to assess, monitor, and enforce their distribution.

There are some programs that permit the unbundling of different water quality credits. Maryland’s water quality trading program allows a farmer to take a single action, such as decreasing fertilizer use, that reduces both phosphorous and nitrogen runoff and then unbundle the resulting phosphorous and nitrogen credits.<sup>188</sup> Each credit can be sold independently to different dischargers. Double counting may not be an issue in this context since the metrics are discretely defined in pounds (in contrast to a wetland credit that represents a suite of functions), and are measuring different gains (phosphorous reduction and nitrogen reduction). Such an approach is consistent with how SO<sub>2</sub> and NO<sub>x</sub> allowances are treated in CAA emissions trading programs.

#### *E. Stacking Endangered Species and Water Quality (and Wetland) Credits*

Our research revealed several examples of projects that intend to stack salmon and water quality credits, but none has yet resulted in unbundling. In Oregon, the Willamette Partnership is a coalition of stakeholders from

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184. *Id.* at 1.

185. *Id.*

186. ADVANCED ECOLOGY, LTD., MITIGATION BANKING INSTRUMENT: SPELLBOTTOM MITIGATION BANK, WALKER COUNTY, TEXAS (June 28, 2011) (on file with authors).

187. *Id.*

188. *Maryland Nutrient Trading*, MD. DEP’T AGRIC., <http://www.mdnutrienttrading.com/> (last visited Sept. 22, 2013).

agencies, environmental organizations, and commercial groups in the Willamette River basin that has developed a protocol for ecosystem credit accounting, which will be tested through various pilot projects.<sup>189</sup> Its initial pilot projects involve removing invasive species and planting native species in riparian areas; these activities are expected to generate both salmon credits and temperature (water quality) credits.<sup>190</sup> The Freshwater Trust, which sponsors three of these projects, will not sell its credits.<sup>191</sup> Instead, its credits will be registered and then retired as a small-scale demonstration of how the credit accounting system will work. In contrast, Half-mile Lane, a project sponsored by the Department of State Lands and Clean Water Services, has been certified to sell salmon, temperature, *and* wetland credits based on the restoration of twenty-five acres of wetland and streams in an agricultural area.<sup>192</sup> Thus far, it has conducted two transactions through Markit Registry.<sup>193</sup>

The Willamette Partnership's credit accounting protocol rules out unbundling these credits, however.<sup>194</sup> When a percentage of wetland credits is sold, the species and temperature credits generated from that same parcel are reduced by the same percentage.<sup>195</sup> Accordingly, this project is not an example of where stacked credits have been unbundled and sold in multiple markets. Again, the interrelatedness and the potential for double counting are a primary concern. The wetland credit already includes water quality and species habitat components and, under the Willamette Partnership protocol, cannot be unbundled.

#### F. *Stacking Endangered Species and Carbon Sequestration Credits*

Our research found one example of a conservation bank that contemplates stacking endangered species and carbon credits. Established in 2010, the Florida Panther Conservation Bank, II is located in Hendry County, Florida.<sup>196</sup>

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189. *Ecosystem Credit Accounting*, WILLAMETTE PARTNERSHIP, <http://willamettepartnership.org/ecosystem-credit-accounting/the-willamette-ecosystem-marketplace> (last visited Sept. 22, 2013); WILLAMETTE P'SHIP, *supra* note 94.

190. *Pilot Projects*, WILLAMETTE PARTNERSHIP, <http://willamettepartnership.org/ecosystem-credit-accounting/pilot-projects> (last visited Sept. 22, 2013).

191. *Id.* (follow "Johnson Creek," "Mohwak Creek," and "Woods Creek" hyperlinks).

192. *Id.* (follow "Half-mile Lane" hyperlink).

193. *Id.*

194. The protocol states:

**Stacking credits:** The creation of different credit types in the same geographic area. It allows landowners to market multiple ecological values at a single site, including those with and without specific geographic delineation. This project is not talking about stacking credits, but will show how to bundle different credits from the same project, by parsing the project into different areas for different markets.

WILLAMETTE P'SHIP, *supra* note 94, at 34 (emphasis in original).

195. *Id.*; Cooley & Olander, *supra* note 156.

196. THE CONSERVATION FUND, CASE STUDY SERIES: THE FLORIDA PANTHER CONSERVATION BANK, II (2010), available at <http://www.conservationfund.org/our-conservation-strategy/major-programs/conservation-leadership-network/cln-resources/mitigation-resources/conservation-banking-case-studies/> (follow "#5 Florida Panther Conservation Bank" hyperlink).

The bankers worked cooperatively with FWS on site selection, and the 472-acre bank is within the panther dispersal zone, an area that provides habitat connectivity.<sup>197</sup> The site is largely forested and approximately 65 percent wetland.<sup>198</sup>

Although there is currently no regulatory-driven carbon market in Florida, the conservation banking agreement identifies carbon sequestration as a potential future use of the property. The conservation bank agreement states that “the Bank’s sponsors, with [FWS] approval, reserve the right to participate in carbon sequestration or other carbon banking programs and native seed harvesting, if appropriate.”<sup>199</sup> FWS was amenable to such an arrangement because it viewed the potential carbon credits as an additional incentive to place the site under a conservation easement.<sup>200</sup>

Such an arrangement does not raise the same additionality concerns as other stacking and unbundling scenarios. First, the stacking scenario was identified and discussed with the regulatory agency up front in the beginning of the banking approval process (in contrast to the North Carolina wetland/water quality example). Second, because the currencies of the markets differ (acres versus tons), there is not the issue where one acre could be counted twice for habitat loss. Moreover, the carbon sequestration function of the site is not intrinsic to conservation of the panther (unlike the relationship between the water quality function and a wetland). Finally, the management of the site for carbon sequestration purposes is subject to FWS approval, which ensures that any such activity will not be detrimental to the panther.

#### *G. Stacking Water Quality and Carbon Sequestration Credits*

Although the survey and our research did not identify specific projects that have already generated both water quality and carbon sequestration credits, this stacking scenario has generated significant interest. For example, in its updated Climate Action Plan, the Maryland Commission on Climate Change contemplates a water quality trading program that also generates carbon credits for use under the state’s recently enacted Greenhouse Gas Reduction Act.<sup>201</sup> The tools to support such approaches are in development by the Natural Resources Conservation Service, which is working with various organizations to develop a calculator that will estimate both water quality *and* carbon credits from agricultural conservation practices (the Nutrient Trading Tool).<sup>202</sup>

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197. *Id.* at 1.

198. *Id.* at 2.

199. *Id.* at 3.

200. *Id.*

201. MD. COMM’N ON CLIMATE CHANGE, UPDATE TO GOVERNOR AND GENERAL ASSEMBLY 10 (2010), available at [http://www.mde.state.md.us/assets/document/Air/ClimateChange/Report\\_1.pdf](http://www.mde.state.md.us/assets/document/Air/ClimateChange/Report_1.pdf).

202. The Nutrient Tracking Tool can be found at *Nutrient Tracking Tool*, U.S. DEP’T AGRIC., <http://nn.tarleton.edu/NTTWebARS/> (last visited Feb. 22, 2013). See also J.A. Delgado et al., *Assessment of Nitrogen Losses to the Environment with a Nitrogen Trading Tool (NTT)*, 63 COMPUTERS & ELECTRONICS AGRIC. 193, 194 (2008) (discussing the Nutrient Trading Tool).

Furthermore, in 2012 the Climate Action Reserve formed a subcommittee to discuss the potential for stacking water quality credits and greenhouse gas credits as part of the development of the Nutrient Management Project Protocol Version 1.0.<sup>203</sup> Version 1.1 was released in January 2013.<sup>204</sup>

An ongoing project that is vetting the stacking of carbon and water quality credits is the Electric Power Research Institute's (EPRI's) Ohio River Basin Water Quality Trading Project. This project was launched in October 2009 in conjunction with USDA, EPA, and state regulators in the Ohio River Basin region. At its core, the EPRI effort is focused on implementing a defensible interstate water quality trading program for nitrogen and phosphorous. But it is simultaneously considering whether there is a defensible approach to selling both water quality and carbon credits.<sup>205</sup> EPRI may utilize its work on the Michigan State University-EPRI *Methodology for Quantifying Nitrous Oxide (N<sub>2</sub>O) Emission Reductions from Reduced Use of Nitrogen Fertilizer on Agricultural Crops*, which was approved by the American Carbon Registry<sup>206</sup> and evaluated under the Verified Carbon Standard's Double Validation process.

The potential for stacking in this scenario is spurred by the fact that both water quality and carbon credits are measured in defined units—pounds of reduction. In contrast to wetland and species credits that are inherently bundles of ecosystem function (acres), water quality and carbon credits may have the potential to be unbundled and sold in separate markets. As such, the same function or benefit is not being sold twice. However, the viability of this scenario remains to be tested.

#### *H. Stacking Wetland and Carbon Sequestration Credits (Wet Carbon Projects)*

Our survey and research did not uncover any cases in the United States of stacked wetland and carbon credits—so-called “wet carbon” projects.<sup>207</sup> This is

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203. CLIMATE ACTION RESERVE, NITROGEN MANAGEMENT PROJECT PROTOCOL, VERSION 1.0, at 18–20 (2012), available at <http://www.climateactionreserve.org/how/protocols/nitrogen-management/> (follow “Nitrogen Management Project Protocol Version 1.0” hyperlink).

204. CLIMATE ACTION RESERVE, NITROGEN MANAGEMENT PROJECT PROTOCOL, VERSION 1.1 (2013), available at <http://www.climateactionreserve.org/how/protocols/nitrogen-management/> (follow “Nitrogen Management Project Protocol Version 1.1” hyperlink).

205. ELEC. POWER RESEARCH INST., WATER QUALITY TRADING: PILOT TRADES FOR COMPLIANCE WITH NUTRIENT CRITERIA AND GREENHOUSE GAS TARGETS (2011), available at [http://www.envtn.org/uploads/EPRI\\_2011\\_Project\\_notice.pdf](http://www.envtn.org/uploads/EPRI_2011_Project_notice.pdf).

206. MICH. STATE UNIV. & ELEC. POWER RESEARCH INST., METHODOLOGY FOR QUANTIFYING NITROUS OXIDE (N<sub>2</sub>O) EMISSIONS REDUCTIONS FROM REDUCED USE OF NITROGEN FERTILIZER ON AGRICULTURAL CROPS, VERSION 1 (2012), available at <http://americancarbonregistry.org/carbon-accounting/msu-epri-methodology-v1>.

207. See DANONE FUND FOR NATURE, GUIDANCE FOR WET CARBON PROJECTS: WET CARBON STANDARDS AND THE PROJECT IDEA NOTE, VERSION 1.0 (2009), available at [http://www.ramsar.org/pdf/danone\\_carbon\\_proposals2009.pdf](http://www.ramsar.org/pdf/danone_carbon_proposals2009.pdf) (discussing wet carbon projects). There is international interest in combining wetland restoration with carbon sequestration. The French company Danone has expressed its willingness to invest in wet carbon projects, specifically large-scale mangrove restoration projects that result in certified carbon offsets. DANONE FUND FOR NATURE, EXPERT WORKSHOP, ACHIEVING

not surprising in light of the limited carbon markets, as well as the significant challenges in quantifying the net amount of greenhouse gases sequestered by a wetland. While some wetlands sequester vast amounts of carbon dioxide and are greenhouse gas sinks, others emit methane and are greenhouse gas sources.<sup>208</sup> Recent studies have suggested that restoration and protection of tidal wetlands may offer the best opportunity to achieve net reductions in greenhouse gas emissions.<sup>209</sup> The American Carbon Registry (ACR) has approved a methodology for quantifying net greenhouse gas reductions from restoring degraded wetlands in the Mississippi delta,<sup>210</sup> and other protocols to measure the contribution of different wetland types are in development.<sup>211</sup>

Although it does not currently involve stacked credits, one wetland restoration demonstration project in Louisiana bears watching. The project, the Luling Oxidation Pond Wetlands Assimilation System in St. Charles Parish, involves the management of municipal wastewater “to restore the hydrology of the wetland and boost plant and soil productivity.”<sup>212</sup> The ACR’s methodology will be used to determine the amount of carbon credits produced.<sup>213</sup> Note, however, that the project will not produce wetland credits. Indeed, ACR’s methodology expressly precludes granting carbon credit to activities “required under Section 404 of the Clean Water Act to mitigate onsite or offsite impacts

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CARBON OFFSETS THROUGH MANGROVES AND OTHER WETLANDS: MEETING REPORT (2009), available at [http://www.ramsar.org/pdf/DFN\\_report\\_Final.pdf](http://www.ramsar.org/pdf/DFN_report_Final.pdf). Its demonstration project in Senegal was recently approved under the U.N. Framework Convention on Climate Change. *The Livelihoods Project of Restoration of Mangroves in Senegal Validated by the United Nations*, DOWN TO EARTH, <http://downtoearth.danone.com/2012/07/11/the-livelihoods-project-of-restoration-of-mangroves-in-senegal-validated-by-the-united-nations/> (last visited Sept. 22, 2013).

208. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, 2006 IPCC GUIDELINES FOR NATIONAL GREENHOUSE GAS INVENTORIES, VOLUME 4: AGRICULTURE, FORESTRY AND OTHER LAND USE, CHAPTER 7: WETLANDS 7.7 (2006), available at [http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4\\_Volume4/V4\\_07\\_Ch7\\_Wetlands.pdf](http://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_07_Ch7_Wetlands.pdf); see also William J. Mitsch et al., *Wetlands, Carbon, and Climate Change*, 28 LANDSCAPE ECOLOGY 583, 584 (2013). The IPCC is currently developing additional guidance on wetlands. Task Force on Greenhouse Gas Inventories, *2013 Supplement to 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands*, INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, <http://www.ipcc-nggip.iges.or.jp/home/wetlands.html> (last visited Sept. 22, 2013).

209. See, e.g., THE WORLD BANK, CAPTURING AND CONSERVING NATURAL COASTAL CARBON (2010), available at [http://siteresources.worldbank.org/EXTCMM/Resources/coastal\\_booklet\\_final\\_nospread11-23-10.pdf](http://siteresources.worldbank.org/EXTCMM/Resources/coastal_booklet_final_nospread11-23-10.pdf); INT’L UNION FOR CONSERVATION OF NATURE & NATURAL RES., THE MANAGEMENT OF NATURAL COASTAL CARBON SINKS (Dan Laffoley & Gabriel Grimsditch eds., 2009), available at [http://cmsdata.iucn.org/downloads/carbon\\_managment\\_report\\_final\\_printed\\_version\\_1.pdf](http://cmsdata.iucn.org/downloads/carbon_managment_report_final_printed_version_1.pdf).

210. *Restoration of Degraded Deltaic Wetlands of the Mississippi Delta*, AM. CARBON REGISTRY, <http://americancarbonregistry.org/carbon-accounting/restoration-of-degraded-deltaic-wetlands-of-the-mississippi-delta> (last visited Sept. 22, 2013).

211. *Climate Change & Greenhouse Gas Offset Protocol Development*, RESTORE AMERICA’S ESTUARIES, <http://www.estuaries.org/climate-change/all-pages.html> (last visited Feb. 24, 2013); Steve Emmett-Mattox, *Verified Carbon Standard (VCS) Approves Wetland Restoration and Conservation as New Carbon Trading Category*, BLUECARBONPORTAL.ORG (Oct. 4, 2012), <http://bluecarbonportal.org/?p=6524>.

212. TIERRA RESOURCES, THE NATION’S FIRST WETLAND CARBON PILOT 1 (2013), available at <http://www.americaenergycoast.org/05012013/050213-AEC-TieriaResourcesLulingOverview.pdf>.

213. *Id.*

to wetlands.”<sup>214</sup> Nevertheless, the project’s proponents are amenable to exploring the possibility of stacking nutrient offset credits in the future.<sup>215</sup>

### I. Summary

As we have seen, there are numerous variations of stacked credits. Producing different types of credits from the same parcel of land or conservation project is not itself controversial. Indeed, agencies and environmental groups encourage a holistic approach to land management and environmental stewardship, which could produce multiple types of credits. It is the unbundling of the credits for sale in multiple markets that gives rise to concerns. Accordingly, as illustrated in Table 3, agencies are generally reluctant to permit such transactions. Federal rules that expressly address the issue tend to prohibit selling stacked credits in multiple markets. Any federal approvals appear to be on an ad hoc basis. State agencies have exhibited a bit more flexibility, but they too have yet to issue clear rules on when selling stacked credits is permissible.

**TABLE 3: RULES AND POLICIES REGARDING THE UNBUNDLING OF STACKED CREDITS.**

Stacking scenario	Transaction rules and policies (may stacked credits be sold in multiple markets?)
Multiple species	Multiple federally protected species: not permitted by FWS policy  Multiple federally and state protected species: permitted on an ad hoc basis (e.g., Lyonia Preserve)
Wetland and species	Not permitted by Corps/EPA regulations and FWS policy
Wetland and water quality	Not permitted by Corps/EPA regulations (as well by NC)
Individual wetland functions (e.g., water quality; flood control; habitat)	Possible, but currently not permitted in practice (e.g., Corps Galveston District)
Individual water quality credits (e.g., reduction of P; reduction of N)	Permitted in some jurisdictions (e.g., MD policy)
Species and water quality	Uncertain
Species and carbon	Permitted on an ad hoc basis (e.g., Florida Panther Conservation Bank)
Water quality and carbon	Permitted in some jurisdictions (e.g., MD policy)
Wetland and carbon	Uncertain, but not permitted under ACR methodology

Concerns expressed about selling stacked credits focus on the need for additionality, interagency coordination, verification of ecological

214. TIERRA RESOURCES, WR METHODOLOGY MODULE, WETLAND RESTORATION METHODOLOGY FRAMEWORK (WR-MF) 7 (2012), available at <http://americancarbonregistry.org/carbon-accounting/WR-MF.pdf>.

215. Sarah Mack, The Nation’s First Wetland Carbon Pilot Project, Remarks at the National Mitigation and Ecosystem Banking Conference, New Orleans, La. (May 9, 2013) (on file with authors).

improvements, monitoring and management, and transparency. Each of these issues is present in any single environmental credit market. Yet the stakes are higher when one project is being relied upon to offset multiple impacts. In such a scenario, the risk of failure is also stacked. We now turn to how this increased risk might be managed to help ensure that stacked credits produce appropriate mitigation and required ecological outcomes.

### III. CONSIDERATIONS FOR A CREDIT STACKING PROTOCOL

A fundamental issue for developing a credit stacking protocol is the determination of precisely what each stacked credit represents. On one side, regulatory agencies need to ensure that the credits appropriately offset impacts. This can be challenging even in one market type. When credits are stacked, the question of additionality becomes even more prominent. On the other side, credit producers may reasonably expect to be compensated for the full range of their conservation actions' environmental benefits. They may not necessarily want to provide ecological and public "co-benefits" free of charge.

We offer six considerations (with clarifications and caveats) that could be taken into account in managing credit stacking transactions and, in doing so, attempt to strike a balance between the public interest in effective environmental mitigation and the credit producers' personal interest in financial return. In some cases, these considerations may lead to a prohibition on selling stacked credits in multiple markets to offset different activities; in others, such transactions may be appropriate.

While environmental markets can be flexible to accommodate social and economic elements such as price, infrastructure, and mechanics, they need to maintain basic scientific integrity and defensibility, especially if credit stacking is involved. While the perspectives of the buyer, seller, and regulator are important in these markets, the quality of the credits must be ensured. More simply, the validity of credit stacking boils down to appropriate mitigation: do the credits appropriately mitigate the impacts that they are intended to offset?

#### *A. Consideration 1: Ecosystem credits that consist of a suite of functions should not be stacked and unbundled.*

In some ways, this consideration is a simple truism. A credit producer should not be able to sell the same environmental benefit twice. The traditional wetland credit provides the best example of an *ecosystem credit*, a credit that encompasses multiple functions or services. The wetland credit, based on area, typically consists of water quality, flood control, species habitat, and other functions. Thus it makes little sense, from a policy or ecological perspective, to allow a producer of a wetland credit to then sell a water quality credit from the same parcel. That water quality function has already been accounted for in the wetland credit and has already been used to offset impacts. To sell a water quality credit separately (after the wetland credit has been sold) results in an environmental loss, because the second impact is not truly offset. Accordingly,

North Carolina took reasonable action in prohibiting the sale of water quality credits from wetland mitigation banks.<sup>216</sup>

Stacked wetland and species credits raise the same concern. As noted above, the Corps and FWS do not permit the unbundling of stacked wetland and species credits because the wetland credits already take into account habitat and wildlife values.<sup>217</sup> This restriction is also likely appropriate, as selling wetlands and species credits from the same parcel to offset separate wetland and endangered species impacts effectively results in selling the credit related to species habitat twice. Yet there are two scenarios where it may be appropriate to permit the unbundling of an ecosystem credit: (1) where the regulatory process does not account for a particular function, and (2) where the functions are separated and tracked in different categories *before* any credit transaction.

The first scenario relates most directly to carbon impacts. When the Corps or the FWS assesses the impacts of a proposed activity under, respectively, the CWA or ESA, it typically does not consider carbon impacts.<sup>218</sup> The agency will therefore not require a carbon offset as a condition of its permission for the activity to proceed. So if a CWA section 404 permittee or an ESA permittee purchases a credit to offset the impacts of its project, it has not necessarily used any carbon sequestration credits that may be associated with the mitigation site. Yet the agency may consider any carbon sequestration associated with the mitigation site to be one of a suite of ecosystem functions bundled inside the credit. In such cases, however, the Corps and the FWS may have little objection to the credit producer selling any additional, unused and unaccounted for carbon credit to some other entity, so long as the management of the site for carbon sequestration purposes is not detrimental to the site's other mitigation goals (multi-use management will be discussed below).<sup>219</sup>

The second scenario contemplates the approach used by the Corps Galveston District.<sup>220</sup> It assigns mitigation bank credits based on functional units. While the district presently does not permit the unbundling of these functional credits, it may be ecologically justifiable to parse out the water quality function from habitat and other functions. Rather than viewing a

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216. See *supra* notes 178–185 and accompanying text (explaining the problems with credit sales at the Neu-Con Umbrella Wetland Mitigation and Stream Restoration Bank).

217. See *supra* notes 173–177 and accompanying text (discussing stacked credits in the context of the Van Vleck Conservation Bank).

218. But see Steve Martin, *An Alternative to Unbundling Ecosystem Services*, NAT'L WETLANDS NEWSL., Sept.–Oct. 2010, at 27 (noting that Corps-EPA guidance on CWA jurisdictional determinations considers “biogeochemical services, such as carbon sequestration, denitrification, carbon transformations, [and] carbon export”).

219. Note, however, that the agency regulating greenhouse gas emissions must still agree to the unbundling, and certain methodologies, such as the ACR's for restoring wetlands in the Mississippi delta, would preclude carbon credits associated with a CWA section 404 mitigation project. See *supra* note 214 and accompanying text.

220. See *supra* notes 186–187 and accompanying text (discussing the Corps Galveston District's approach).



wetland credit as a suite of functions, each functional credit could be sold individually to offset the relevant impacts. The benefit of such an approach is that the offsets are seemingly more accurately aligned with the impacts. Yet, as Robertson and Mikota note, “a wetland’s component functions do not unstack and restack like so many legos: denitrification is intimately intertwined with duck habitat and carbon sequestration through a thousand—mostly unknown or unquantified—ecological pathways.”<sup>221</sup> Another concern with such an approach would be whether the agency has the resources and scientific data to properly assess, monitor, and verify the specific functional gains and losses. Accordingly, agencies should be wary about unbundling individual functions from an ecosystem credit even in these two scenarios.

*B. Consideration 2: Stacking and unbundling credits should not result in habitat loss.*

As discussed, the issue of habitat is most relevant with stacked multiple species credits or with stacked wetland and species credits. An additional reason for not permitting these transactions relates to a discomfort with overall habitat loss. Consider conservation banks with multiple types of species credits. On one level, it may seem inherently wrong to permit *one* acre of mitigation (that contains habitat for the scrub jay and the sand skink) to be used to offset *two* acres of development (one acre of development that affects scrub jays and a different acre that affects skinks). The opposition may flow from the particular metric. In these cases, area is often the metric for, or a critical factor in, determining the number of credits. If area, which is intrinsically linked to the credit, is the focus, then the use of the site to offset two different projects does seem like double counting. That may not be the case, however, if the focus is on the species, rather than the area. The more compelling objection may then be that this unbundling now stacks the risks on one particular acre. Critics may also cite the potential lack of additionality, since selling the first credit committed the acre to conservation, regardless of whether another credit was sold later.

The one case we identified where agencies were amenable to allowing a single parcel to offset impacts to two different species from two different projects was the Lyonia Preserve in Florida.<sup>222</sup> But here, while area was instrumental in the scrub jay credit calculations, the gopher tortoise credits relied on a different metric: live animals, which were relocated from the impact sites. The use of the different metric alleviates some of the concern about double counting as it rewards a different conservation action. This should alleviate concerns about additionality because the introduction of a tortoise is an additional step taken by the land managers that is separate from management of the area for scrub jay purposes.

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221. Robertson & Mikota, *supra* note 101, at 14.

222. See *supra* notes 163–166 and accompanying text (discussing the Lyonia Preserve).

*C. Consideration 3: Managing the site for one credit type should not denigrate the ecological values represented by other credit types.*

One possible benefit of stacking credits is that a credit producer may not be inclined to manage the site to maximize one type of credit to the detriment of others. From an ecological perspective, managing a site based on an ecosystem approach would be most preferable. Such an approach, however, might not yield the maximum number or type of credits desired by a credit producer if it is only focused on one market, such as carbon. In theory (and depending on the terms of a bank enabling instrument), a conservation banker could plant trees on a conservation bank site to engage in the carbon market. What if such a practice reduces the preferred habitat for protected wildlife? If the credit seller, however, wants to generate both species and carbon credits, it would be incentivized to consider the best mix of practices that will provide multiple credit types—and multiple ecological benefits.<sup>223</sup>

The Florida panther conservation bank offers a helpful example in this regard.<sup>224</sup> The bank sponsors reserved rights in carbon sequestration (should a market in Florida develop), subject to FWS approval. Presumably FWS will grant permission only so long as the planting of trees does not detract from the site's suitability for panther habitat. Panther habitat will remain protected, and the bank sponsors have another potential revenue stream from carbon credits.

*D. Consideration 4: Regulatory agencies need the resources and capacity to confirm the ecological validity of the transactions.*

The environmental credit markets are enabled by regulation, and regulatory agencies oversee the validity of credit transactions. A very legitimate concern is that agencies have enough challenges dealing with one type of credit, let alone overseeing the validity of even more complex cases of credit stacking.<sup>225</sup> For this reason, the agencies need adequate resources, scientific data, and capacity to confirm the ecological validity of the transactions.

In the past several years, federal and state agencies have reduced their staffing levels. If, as a result, the regulatory agencies lack the requisite personnel to oversee a complex stacking system, the market and ecosystems may suffer. There may be delays in permit reviews, bank approvals, and offset

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223. Wayne White & Jemma Penelope, *Stacking and Unstacking: The Economics, the Conservation, and the Conversation*, NAT'L WETLANDS NEWSL., Mar.–Apr. 2013, at 6, 7 (“Higher returns attract more investment, but also greater interest in restoring more components of that ecosystem. More, better restoration might result if stacking and unstacking were mainstream.”).

224. See *supra* notes 196–200 and accompanying text (discussing Florida Panther Conservation Bank).

225. A 2001 National Research Council report highlighted the lack of agency resources with respect to monitoring and enforcement of wetland mitigation projects. NAT'L RESEARCH COUNCIL, *supra* note 22. For a report that highlights the concern over the ecological validity of a particular wetland mitigation bank, see Royal C. Gardner, *Mitigation Banking and Reputational Risk*, NAT'L WETLANDS NEWSL., Nov.–Dec. 2012, at 10.

authorizations. More importantly, underfunded agencies may lack the ability to monitor and verify the environmental benefits that credits are supposed to represent.

In the financial sector, agencies were unable to regulate credit default swaps, mortgage-backed securities, and other exotic financial instruments (and the players themselves did not fully understand how these instruments worked). Unbundling intertwined ecosystem credits can produce a similarly complex challenge. The big difference, however, is that Congress could authorize a bailout of the financial banks. If environmental banks fail, Congress cannot easily bail out the resulting net loss of ecosystem functions. In light of this risk, credit stacking may only be appropriate where there is regulatory competence, scientific expertise, and sufficient legislative appropriations.

*E. Consideration 5: Any stacking and unbundling of credits should be transparent.*

Transparency is a critical feature for the credibility of any credit stacking program because it can contribute to public confidence that the markets are operating as they should and that the mitigation projects are providing appropriate offsets. Ideally, transparency would occur at several different phases of a credit stacking program: the establishment of projects; the sale of credits; and the monitoring and verification of the projects.

For example, the agencies could provide public notice and seek public comments when reviewing a proposal to establish a project that involves credit stacking. The Corps and FWS already do this during establishment of wetland banks and conservation banks, and these public notices provide an opportunity to specify whether stacked credits are involved. The agencies could also make available details of when a credit is sold to offset environmental impacts, similar to public information associated with an NPDES permit. Finally, on-the-ground monitoring and verification reports could be appropriate for public review as well.

Several projects are underway for creating infrastructure that could support the trading of multiple credit types (even if the project itself does not deal with unbundling stacked credits). These include the Willamette Partnership in Oregon (salmon habitat, wetlands, and water quality),<sup>226</sup> the Bay Bank in Chesapeake Bay (biodiversity, carbon, and water quality),<sup>227</sup> and the Ohio River Basin Trading Project (water quality and carbon).<sup>228</sup> All of these

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226. For information about the Willamette Partnership's Ecosystem Crediting Platform, see *Ecosystem Crediting Platform*, WILLAMETTE PARTNERSHIP, <http://willamettepartnership.ecosystemcredits.org/> (last visited Sept. 22, 2013).

227. For information about the Bay Bank's Marketplace, go to *Marketplace*, BAY BANK, <http://www.thebaybank.org/marketplace> (last visited Sept. 22, 2013).

228. For information about the Ohio River Basin Trading Project, go to *Ohio River Basin Trading Project*, ELECTRIC POWER RES. INST., <http://wqt.epri.com/index.html> (last visited Sept. 22, 2013).

efforts plan to utilize a web-based trading platform that will facilitate credit sales, monitoring, and tracking.

The efforts at transparency, however, may be linked to agency capacity. As demonstrated with the Corps' early experience with the Regulatory In-Lieu Fee and Bank Information Tracking System (known as RIBITS), it can be difficult for a single agency to establish a web-based accounting system for one type of credit.<sup>229</sup> A larger effort, involving multiple state and federal agencies and multiple types of credits, will need even more diligence.

*F. Consideration 6: Tests for additionality should be applied.*

A common concern about the sale of stacked credits is the perceived lack of additionality. Agencies do not want to give credit to a landowner or entity simply for business as usual or for actions that the landowner or entity would be taking regardless of the existence of the credit market. This concern has led to a plethora of tests, many of which can be complicated to apply in practice. For example, complex additionality tests in greenhouse gas emission regimes lead those who certify credits to attempt to ascertain an actor's motivations or to determine whether the project is not economically feasible without the revenue from the credits. These tests can be frustrating for all involved because they can operate as barriers to the market, but they can also be gamed.<sup>230</sup> A more straightforward approach would be helpful, and the experience with SO<sub>2</sub> and NO<sub>x</sub> allowances provides a good example.

Consider the case of an electric utility with SO<sub>2</sub> and NO<sub>x</sub> allowances that decides to operate a higher-emitting unit at a reduced capacity. The decision results in fewer emissions, and the utility therefore consumes fewer SO<sub>2</sub> and NO<sub>x</sub> allowances. The single conservation action (operating a unit at a reduced level) has effectively produced two types of environmental "stacked credits" (SO<sub>2</sub> and NO<sub>x</sub> allowances) that can be sold to other utilities. The significant point for our purposes is that the utility may unbundle the allowances and sell its SO<sub>2</sub> allowances to one utility and its NO<sub>x</sub> allowances to a different utility. Accordingly, the EPA has been permitting the sale of unbundled allowances in the CAA context for years. How then is the question of additionality treated here?

It appears that the legal/regulatory test is implicitly applied. Under this approach, the question is whether the project or action has reduced emissions below the level required by laws or regulations. The utility is under no legal obligation to reduce its emissions below its total number of allowances. When

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229. Hannah Kett, *RIBITS Is Great; Why Not Make It Better?*, ECOSYSTEM MARKETPLACE (Dec. 20, 2010), [http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page\\_id=7905&section=news\\_articles&eod=1](http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=7905&section=news_articles&eod=1) (noting that "only 28 of the 38 USACE districts have viewable public information" on RIBITS).

230. For a recent judicial decision discussing the difficulties of applying additionality tests in the CDM context, see *Citizens Climate Lobby v. Cal. Air Res. Bd.*, No. CGC-12-519554, 2013 WL 861396 (Cal. Super. Ct. Jan. 25, 2013).

it does so, however, it has excess allowances to sell. The EPA does not inquire into the business reasons or individual motivations behind the decision to reduce emissions; it simply looks at the net environmental benefit. And in this case, the environmental benefits are susceptible to separate quantification. Although a single activity (or foregone action) creates two types of excess allowances (effectively credits for our purposes), they are not intrinsically intertwined like a wetland and water quality credit or a wetland and species habitat credit. The monitoring process allows the utility to report precisely how many tons of SO<sub>2</sub> and how many tons of NO<sub>x</sub> it has (or has not) emitted over a given period of time. Perhaps it is the fact that the environmental benefits can be quantified separately—and accurately—that justifies allowing the allowances to be unbundled and sold to different utilities.

Timing is also relevant to the issue of additionality. The rules regarding the use of stacked credits should be established at the project's inception. There should not be a blanket ban on transactions involving initially unanticipated credits, however. Some markets may develop after a project has been established. In such cases, the credit producer should be required to show some "ecological" additionality—additional steps the credit producer is taking to increase environmental outputs (beyond those already required or contemplated under the original authorization).

#### CONCLUSIONS AND FINAL OBSERVATIONS

Ultimately, environmental markets need to provide appropriate mitigation for impacts. The mitigation must be scientifically defensible and subject to rigorous oversight. If credits are not truly mitigating impacts, stacked or not, then environmental markets will be at risk for failure. A market failure harms not only market participants, but, more importantly, harms the public that relies on ecosystem services. It is important for environmental markets to be carefully structured, since research indicates a degradation of moral values and behavior in competitive market frameworks.<sup>231</sup>

Environmental laws such as the CWA, ESA, and California's Global Warming Solutions Act have created regulatory drivers that have led to many thousands of credit transactions and the emergence of a solid framework for market-based mitigation. The question emerging now is how the individual environmental markets will interact.

Properly designed, a credit stacking regime could provide environmental benefits. With the potential for additional profit to be made, credit stacking could lead to greater financial investment in conservation projects and more participation by willing landowners. Credit stacking could also serve as a driver to manage for an entire ecosystem rather than for the benefit of only one credit type.

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231. See Armin Falk & Nora Szech, *Morals and Markets*, 340 *Sci.* 707 (2013).

Nevertheless, many significant challenges remain before credit stacking can be implemented on a large scale. Agencies (federal and state) must coordinate to develop the rules, policies, and protocols that establish minimum standards for credit stacking projects. Moreover, these agencies must have the resources and scientific expertise to appropriately track stacked credits and verify additionality.

Even in the absence of clear direction from agencies and standard protocols, however, innovative pilot projects are proceeding to test the possibilities of credit stacking. These efforts are rapidly moving the credit stacking discussion from concept to reality, and they are helping to identify scientifically justifiable approaches. Based on our analysis, it seems that the most appropriate credit stacking scenario is when the accounting units are pollutant-specific, such as pounds of nitrogen in water quality trading, and tons of CO<sub>2</sub> equivalents in carbon markets.

As Daily and Ellison point out, “A great unanswered question is whether the drive for profits, which has done so much to harm the planet, can possibly be harnessed to save it.” Credit stacking could provide great economic incentives for effective conservation, but only after the fundamental considerations described here are addressed.