

THE STATE AND REGIONAL ROLE IN DEVELOPING ECOSYSTEM SERVICE MARKETS

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I. INTRODUCTION

Ecosystem services literature and the theoretical models of ecosystem service markets have so far been based upon a few well-studied examples—most notably New York City’s mid-1990s purchase and preservation of land in the Catskills watershed to meet its water purification goals.¹ Since then, around the nation, state and local governments, businesses, and non-governmental organizations (“NGOs”) have moved beyond the theoretical and single transactions to develop and test a variety of ecosystem service markets. Oregon environmental groups, governments, and businesses have been leaders in supporting and encouraging market development and working with regional partners interested in cooperation at larger scales.² Nearby, the Puget Sound Partnership is creating a sound-wide ecosystem restoration plan and the tools to move a restoration

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1. See Graciela Chichilnisky & Geoffrey Heal, *Economic Returns from the Biosphere*, 391 NATURE 629 (1998); NAT'L RESEARCH COUNCIL, WATERSHED MANAGEMENT FOR POTABLE WATER SUPPLY: ASSESSING THE NEW YORK CITY STRATEGY (2000).

2. The Oregon Business Plan, developed by business leaders, supports increasing the use of ecosystem service marketplaces. It has helped form an Ecosystem Services Council. See Oregon Business Plan: The Plan, <http://www.oregonbusinessplan.org/accomplishments.html> (last visited June 4, 2010).

agenda forward.³ Other states and countries now are turning to Oregon and the Pacific Northwest to learn how they can make ecosystem markets work. As Oregon remains at the forefront of these markets, lessons learned from Oregon's experiments may provide a foundation for expanding ecosystem markets around the world.

This article first describes five different types of ecosystem service markets in Oregon. The article next highlights the lessons learned from these markets, and then discusses the potential role of state government in market development based on these observations. The final section of the article describes Senate Bill 513,⁴ a recently adopted Oregon law aimed at promoting ecosystem market development, and reflects on its implications for future market development and expansion.

II. OREGON'S STATE-LEVEL EXPERIMENTATION

A. *Carbon Dioxide and Greenhouse Gases*

The public is more familiar with carbon markets than other ecosystem service markets, as President Obama and the 111th Congress work to pass a national cap-and-trade program⁵ as part of a global effort to limit emissions of carbon dioxide and other greenhouse gases (GHGs). The cap-and-trade marketplace is designed as one solution to combat global climate change. Centuries of industrialization and fossil fuel combustion have increased atmospheric GHG concentrations,⁶ contributing to a worldwide increase in global average temperatures and local climate changes.⁷ People, governments, and businesses worldwide are now trying to curb or sequester greenhouse gas production to mitigate climate change.

3. See generally Puget Sound Partnership, <http://www.psp.wa.gov> (last visited June 4, 2010).

4. S.B. 513, 75th Leg. Assem., Reg. Sess. (Or. 2009).

5. American Clean Energy and Security Act of 2009, H.R. 2454, 11th Cong. (as passed by House, Jun. 26, 2009).

6. See INTERGOVERNMENTAL PANEL OF CLIMATE CHANGE, IPCC FOURTH ASSESSMENT REPORT (AR4): CLIMATE CHANGE 2007: SYNTHESIS REPORT 36 (2007) (showing a 70% increase of annual GHG emissions since 1970).

7. See *id.* at 38-54.

Many ecosystems naturally store large quantities of carbon dioxide in trees, soils, and biomass.⁸ Because storing carbon dioxide reduces the total amount of atmospheric carbon and its associated effects, this is a valuable ecosystem service even if it had never been historically thought of in monetary terms. Carbon markets provide a way to foster the creation or preservation of nature's credit-sequestering services. Carbon markets allow greenhouse gas emitters who may have to reduce their emissions to invest in carbon sequestration or to purchase offset credits from other emitters, allowing them to make reductions more cheaply.⁹

The federal government has only recently begun to implement national carbon dioxide policies.¹⁰ Oregon, alongside other states, has long led American efforts to combat climate change.¹¹ In 1997, Oregon enacted the nation's first emission reduction standard, requiring new fossil-fueled power plants to reduce the emission of carbon dioxide (CO₂) to 0.7 pounds per kilowatt-hour.¹² From the beginning of the reduction standard, power plant facilities were allowed to purchase offsets to meet these CO₂-emissions goals by buying credits from a qualified organization or by creating projects themselves.¹³ Oregon's Energy Facility Siting Council monitors and evaluates all credits and offsets, but third parties, such as those described below, can create them.¹⁴

8. Dennis D. Hirsch, *Trading in Ecosystem Services: Carbon Sinks and the Clean Development Mechanism*, 22 J. LAND USE & ENVTL. L. 623, 629 (2007).

9. *Id.* at 627–28.

10. Press Release, U.S. Env'tl. Prot. Agency, Greenhouse Gases Threaten Public Health and the Environment (Dec. 7, 2009) (announcing EPA's endangerment finding for six greenhouse gases).

11. See generally BARRY G. RABE, GREENHOUSE & STATEHOUSE: THE EVOLVING STATE GOVERNMENT ROLE IN CLIMATE CHANGE (Pew Center on Global Climate Change, Nov. 2002), available at http://www.pewclimate.org/docUploads/states_greenhouse.pdf; See also JAMES A. ROBINSON, Note, *Shaping Oregon Climate Policy in Light of the Kyoto Protocol*, 21 J. ENVTL. L. & LITIG. 207, 227–33 (2006). The city of Portland, Oregon has also been long involved in targeting climate change. In 1993, it became the first city to adopt a climate strategy. *Id.*; CITY OF PORTLAND, GLOBAL WARMING REDUCTION STRATEGY (Nov. 1993), available at <http://www.portlandonline.com/bps/index.cfm?c=41917&a=112110> (focusing on transportation, energy efficiency, cogeneration, recycling, and tree planting). Portland has updated its plan, most recently in November 2009. CITY OF PORTLAND, CLIMATE ACTION PLAN (Sept. 2009), available at <http://www.portlandonline.com/bps/index.cfm?c=41896> (focusing on green building, clean energy, green jobs, efficient urban planning, recycling, urban forests and ecosystems, local agriculture, and community engagement).

12. H.B. 3543, 74th Leg. Assem., Reg. Sess. (Or. 2007); OR. REV. STAT. § 469.503 (2007); OR. ADMIN. R. § 345-024-0500 – 0720 (2009).

13. OR. REV. STAT. § 469.503.

14. *Id.*

1. The Climate Trust

Adoption of the reduction standard legislation in 1997 also gave birth to the Climate Trust, an organization established to finance carbon credit projects to resell to power plants required to meet the state standard.¹⁵ Through 2010, the Climate Trust remains the sole organization qualified to generate credits for Oregon's emissions program.¹⁶ Since its inception, The Climate Trust has emerged as one of the largest bankers of offsets in the United States with \$8.8 million invested in a diverse portfolio of carbon reduction projects.¹⁷ This portfolio includes 16 projects of nine different types expected to offset nearly 2.8 million metric tons of carbon dioxide.¹⁸ In addition to investing in carbon credit projects, The Climate Trust provides customized offset-acquisition services for large emitters, voluntary programs for organizations and events, and consulting on climate projects, policy, and strategy.¹⁹

Adopting the CO₂ emission reduction standard as a credit driver and creating of The Climate Trust allowed Oregon lawmakers, environmental organizations, and businesses to see how an ecosystem service market could deliver efficient, cost-effective environmental results. Several Oregon power plants have purchased mandated offsets and other Oregon companies have worked with The Climate Trust to help them voluntarily develop waste-to-energy programs.²⁰

2. Ecotrust

Ecotrust was founded in Portland, Oregon in 1991 to bring the best sustainability and conservation ideas from around the world to the United States.²¹ Ecotrust provides its clients consulting, capital, knowledge, organization, and innovation to conservation in order to

15. The Climate Trust, History, <http://www.climatetrust.org/history.html> (last visited June 4, 2010).

16. THE CLIMATE TRUST, 2008 ANNUAL REPORT 3 (2008), *available at* [http://www.climatetrust.org/pdfs/2008 Annual Report.pdf](http://www.climatetrust.org/pdfs/2008%20Annual%20Report.pdf); Oregon.gov, Energy Facility Siting Standards, http://www.oregon.gov/ENERGY/SITING/standards.shtml#Carbon_Dioxide_Emissions (listing The Climate Trust as the only qualified organization).

17. *See id.* at 7.

18. The Climate Trust, Offset Portfolio, <http://www.climatetrust.org/offset.html> (last visited June 4, 2010).

19. The Climate Trust, Climate Services, http://www.climatetrust.org/climate_services.html (last visited June 4, 2010).

20. *See* THE CLIMATE TRUST, *supra* note 16, at 2, 4, 11.

21. Ecotrust, About Us, <http://www.ecotrust.org/about/> (last visited June 4, 2010).

tackle a variety of ecological, economic, and social problems.²² As one of its consulting specialties, Ecotrust advises communities, tribes, and land managers on how they can successfully implement carbon offset programs to generate verifiable and salable credits.²³ These credits allow forest owners to manage their resources to maximize carbon sequestration, not just timber production.²⁴ In addition to consulting, Ecotrust has also taken the lead advocating for ecosystem service markets across the Pacific Northwest. It helped Portland become the host site for the first international Katoomba conference on ecosystem markets held in the United States,²⁵ and it is working with the Western Climate Initiative to support inclusion of forest carbon storage offsets in its cap-and-trade programs.²⁶

Ecotrust now invests directly in carbon storage with the 2004 formation of Ecotrust Forest Management, Inc.²⁷ This Ecotrust subsidiary currently manages 12,449 acres in four temperate rain forests.²⁸ These forests will provide financial returns from a mixture of carbon credits, easements, forest waste as biofuel, non-timber forest products, and timber harvest, while promoting native species, forest health, habitat, and biodiversity.²⁹

B. Water Quantity

Even before Oregon's carbon market started in 1997, Oregon had experience experimenting with markets to restore streamflow for aquatic habitat.³⁰ Like other Western states, Oregon allocates water

22. *See id.*

23. Ecotrust, Forest Management Planning for Carbon, Ecosystems, and Communities, <http://www.ecotrust.org/trees/> (last visited June 4, 2010).

24. Ecotrust, Ecosystem Services, <http://www.ecotrust.org/ecosystemservices/> (last visited June 4, 2010).

25. Ecotrust, Portland Katoomba, <http://www.ecotrust.org/katoomba/> (last visited June 4, 2010); Katomomba Group, Making the Priceless Valuable: Jumpstarting Environmental Markets, http://www.katoombagroup.org/~katoomba/event_details.php?id=11 (last visited June 4, 2010) (describing the Portland conference).

26. Ecotrust, Western Climate Initiative, <http://www.ecotrust.org/wci/> (last visited June 4, 2010).

27. Ecotrust Forest Management, Inc., <http://www.ecotrustforests.com/> (last visited June 4, 2010).

28. ECOTRUST FOREST MANAGEMENT, INC., FOREST MANAGEMENT PLAN 9 (Mar. 2009), available at http://www.ecotrustforests.com/EFM_Plan_public_summary_March_2009.pdf

29. *See generally id.*; ECOTRUST FOREST MANAGEMENT, INC., INVESTOR GUIDE, available at http://www.ecotrustforests.com/EcoForests_investor_book.pdf.

30. The Freshwater Trust, Why We Need a Water Trust, <http://www.thefreshwatertrust.org/who-we-are/about-us> (last visited June 4, 2010).

from rivers based on the prior appropriation doctrine.³¹ This “first in time, first in right” doctrine means that earlier acquired “senior” water rights have priority over later “junior” rights.³² This system lends itself to a market, subject to numerous regulations.³³ Holders of senior water rights may sell or transfer their right to divert water to others.³⁴ In theory, this should move water to its highest economic use, as those who can generate more economic value from the water can afford to acquire senior water rights. The private water market should efficiently allocate water between traditional water uses (*i.e.*, agriculture, municipalities, and industry); however, water markets have been slow to develop even for reallocation of traditional consumptive water rights.³⁵

Oregon was one of the first states to protect instream flows³⁶ for what are now called “ecosystem services,” which it did in 1955 but only by administrative rule.³⁷ A more market-based approach toward conserving instream water was adopted with the passage of the Instream Water Rights Act in 1987.³⁸ This Act formally recognized instream flow as a beneficial use and authorized the sale, gift, and leasing of existing water rights to instream uses.³⁹ This expanded potential water-market participants to include conservation organizations that could purchase water rights to “re-water” Oregon creeks and streams.⁴⁰ Since then, a number of innovative

31. See RICH BASTASCH, *THE OREGON WATER HANDBOOK: A GUIDE TO WATER AND WATER MANAGEMENT* 54–57 (2006 rev. ed. of *WATERS OF OREGON*, 1998).

32. See *id.* at 56–57; OR. WATER RES. DEP’T, *AN INTRODUCTION TO WATER LAWS: WATER RIGHTS IN OREGON* 4–7 (2008), available at www1.wrd.state.or.us/pdfs/aquabook.pdf.

33. See OR. ADMIN. R. ch. 690 divs. 380 & 385; BASTASCH, *supra* note 31, at 132–36.

34. See BASTASCH, *supra* note 31 at 132–136; OR. WATER RES. DEP’T, *supra* note 32, at 29–30.

35. BRENT M. HADDAD, *RIVERS OF GOLD: DESIGNING MARKETS TO ALLOCATE WATER IN CALIFORNIA* (2000); NAT’L RESEARCH COUNCIL, *WATER TRANSFERS IN THE WEST: EFFICIENCY, EQUITY, AND THE ENVIRONMENT* (1992).

36. For a definition and brief discussion of instream flows, see the State of Washington Department of Ecology’s website, <http://www.ecy.wa.gov/programs/wr/instream-flows/isfhm.html>.

37. See generally, Janet Neuman, Anne Squier & Gail Achterman, *Symposium Article: Sometimes a Great Notion: Oregon’s Instream Flow Experiments*, 36 ENVTL. L. 1125 (2006) (explaining Oregon’s history of instream flow protection); Janet Neuman, *Symposium Article: The Good, The Bad, and The Ugly: The First Ten Years of the Oregon Water Trust*, 83 NEB. L. REV. 438 (2004).

38. OR. REV. STAT. § 537.332–360 & 455–500 (2007).

39. *Id.*

40. See Neuman et al., *supra* note 37, at 1151–53.

organizations and programs have developed to use water markets to restore streamflows and the ecosystem services they provide.

1. Oregon Water Trust/The Fresh Water Trust

The Oregon Water Trust (OWT) was the first water trust in the nation when it was founded in 1993 with the goal of restoring surface water flows in Oregon through science-driven, market-based, and cooperative solutions.⁴¹ To reach these goals, OWT focuses on purchasing or leasing water rights in small tributary streams where small amounts of water provide significant ecological benefits.⁴² They also work to help farmers and other water users improve their efficiency through water conservation and then convert the “saved” water into increased instream water rights.⁴³ Through these mechanisms, The OWT/Freshwater Trust’s portfolio of water rights is now more than 150 cubic feet per second (cfs; 100 million gallons per day).⁴⁴

2. Deschutes River Conservancy

The Deschutes River Conservancy (“the DRC”) works to improve water quality and streamflow in the Deschutes Basin of Central Oregon.⁴⁵ It was created in 1996 by the Confederated Tribes of the Warm Springs Indian Reservation, several local irrigation districts, and environmental organizations. It is authorized to receive federal funding for watershed restoration.⁴⁶ The DRC operates much

41. See generally *id.*; Mary Ann King, *Getting Our Feet Wet: An Introduction to Water Trusts*, 28 HARV. ENVTL. L. REV. 496 (2004); Lynne Marie Parechan, *Choreographing NGO Strategies to Protect Instream Flows*, 42 NAT. RESOURCES J. 33 (2002); The Freshwater Trust, *supra* note 30. OWT recently merged with Oregon Trout to become The Freshwater Trust, but it continues to operate a similar focus and mission. The Freshwater Trust, <http://www.thefreshwatertrust.org/conservation/stream-flow/approach> (last visited June 5, 2010). This paper will use the abbreviation OWT to refer to both the previous Oregon Water Trust and the newly renamed The Freshwater Trust.

42. *Id.*

43. See Neuman, *supra* note 37, at 444–45.

44. The Freshwater Trust, *From the Trust*, 1 FRESHWATER 30 (Fall 2009).

45. Deschutes River Conservancy, About Us, http://www.deschutesriver.org/About_Us/ (last visited Jan. 10, 2010); Oregon Resource Conservation Act of 1996, Pub. L. No. 104-208, § 301(b)(3), 110 Stat. 3009 (1996) (authorizing the Bureau of Reclamation to pay “up to 50 percent” of the cost of approved projects) (reauthorized by the Deschutes Resources Conservancy Reauthorization Act of 1999, Pub. L. No. 106-270, 114 Stat. 791 (2000)). These matching sources include corporate, foundation, and individual funding, state and federal agencies, as well as the development of fee-for-service enterprises. About the Deschutes Resources Conservancy, <http://www.deschutesrc.org/about/about.htm> (last accessed Mar. 24, 2004) (on file with the Harvard Environmental Law Review).

46. Deschutes River Conservancy, *supra* note 45.

like other water trusts by acquiring water through conservation projects, water leases, and water rights purchases. One type of conservation project is the piping and lining of irrigation ditches.⁴⁷ DRC's lining projects help reduce the excessive seepage and evaporation losses from diverted irrigation water in unlined ditches. The DRC piping and lining projects resulted in 54 cfs (35 million gallons per day) of permanent instream flow restoration.⁴⁸ Moreover, the DRC is active in water leasing, which allows water owners to continue "beneficially using" water rights they are not presently using for irrigation by leasing them to the DRC for instream purposes.⁴⁹ The DRC also purchases water rights outright and accepts donations of water rights that are no longer needed by their current owners.⁵⁰ Both the owned and leased water is returned to instream usage to restore instream flows for a season or permanently.⁵¹

Beyond acquiring water rights to increase instream flow, the DRC collaborates with Deschutes basin water users⁵² through the Deschutes Water Alliance Water Bank and Groundwater Mitigation Bank⁵³ to provide mitigation credits needed by cities, real estate developers, and others to offset new groundwater withdrawals. Under state law, new groundwater permit applicants in the Deschutes

47. Deschutes River Conservancy, Water Conservation, http://www.deschutesriver.org/What_We_Do/Streamflow_Restoration/Water_Conversation (last visited Jan. 10, 2010).

48. *Id.*

49. Deschutes River Conservancy, Water Leasing, http://www.deschutesriver.org/What_We_Do/Streamflow_Restoration/Water_Leasing (last visited Jan. 10, 2010). It is important to landowners to be legally seen as "beneficially using" their water rights so they do not risk forfeiting them. OR. REV. STAT. § 536.310(1); BASTASCH, *supra* note 31, 59–60.

50. Deschutes River Conservancy, Water Transfers, http://www.deschutesriver.org/What_We_Do/Streamflow_Restoration/Water_Transfers (last visited June 4, 2010).

51. Deschutes River Conservancy, Water Leasing, *supra* note 49.

52. The current members of the Deschutes Water Alliance are the Deschutes River Conservancy, Central Oregon Irrigation District, Swalley Irrigation District, City of Bend, City of Redmond, and Avion Water Company. Deschutes River Conservancy, Deschutes Water Alliance, http://www.deschutesriver.org/What_We_Do/Partnerships/Deschutes_Water_Alliance/default.aspx (last visited May 10, 2010). The Water Alliance Water Bank also acquires water rights permanently and temporarily from irrigation districts for instream purposes apart from the groundwater mitigation program in order to preserve agricultural water rights and contribute to streamflow restoration. DESCHUTES WATER ALLIANCE, WATER BANK: BALANCING WATER DEMAND IN THE DESCHUTES BASIN 1 (2008), http://www.deschutesriver.org/CEDocuments/Downloads_GetFile.aspx?id=323478&fd=0 (last visited June 4, 2010).

53. Deschutes River Conservancy, Water Banking, http://www.deschutesriver.org/What_We_Do/Water_Banking/Water_Bank/ (last visited June 10, 2010).

Basin must acquire mitigation credits⁵⁴ to “offset the potential interference with hydraulically connected surface waters caused by ground water withdrawals within the Deschutes River Basin.”⁵⁵ The program was recently evaluated, demonstrating its overall contribution to streamflow restoration.⁵⁶ The DRC administers these water banks in cooperation with local irrigation districts, municipalities, landowners, and the Oregon Water Resources Department.⁵⁷

The net result is that the DRC and the water banks have made significant headway in meeting the Oregon Department of Fish and Wildlife’s targets for stream flow on several priority creeks and rivers. For instance, Whychus Creek historically dried up every summer, but saw summer flows of 15 cfs in 2007, nearly meeting the 20 cfs target.⁵⁸ In the Middle Deschutes River, south of Bend, Oregon, the DRC’s cooperative approach has raised flows from the historic low level of 30 cfs to 115 cfs in 2008, bringing it almost halfway to the 250 cfs target.⁵⁹

3. Columbia Basin Water Transaction Program

The Northwest Power and Conservation Council (the “Council”) developed a comprehensive Fish and Wildlife Program beginning in 1982 under the Northwest Power Act.⁶⁰ In spite of its call for instream flow restoration in the Columbia River Basin, very little water was

54. H.B. 2184, § 2 (Or. 2001) (codified at OR. REV. STAT. § 537.746 (2007)); *see also* H.B. 3494 (Or. 2005).

55. *Id.* § 2; *see also*, Martha O. Pagel, *Creative Programs and Projects to Increase Water Supply Mitigation and Mitigation Banking: Strategies for Meeting New Supply Needs in Oregon’s Deschutes Basin*, 6 U. DENV. WATER L. REV. 29 (2002-2003) (describing the development of the regulatory program).

56. *See* OR. WATER RESOURCES DEP’T, DESCHUTES GROUNDWATER MITIGATION: PROGRAM FIVE-YEAR PROGRAM EVALUATION REPORT (2008), *available at* http://www1.wrd.state.or.us/pdfs/Deschutes_Mitigation_5_Year_Review_Final_Report.pdf.

57. *See* DESCHUTES WATER ALLIANCE, DESCHUTES WATER ALLIANCE WATER BANK: BALANCING WATER DEMAND IN THE DESCHUTES BASIN (2008), http://www.deschutesriver.org/CEDocuments/Downloads_GetFile.aspx?id=323478&fd=0 (last visited June 5, 2010).

58. Deschutes River Conservancy, Whychus Creek, http://www.deschutesriver.org/Our_Basin/Upper_Deschutes/Whychus_Creek/default.aspx (last visited June 4, 2010).

59. *See* Deschutes River Conservancy, Middle Deschutes River http://www.deschutesriver.org/Our_Basin/Upper_Deschutes/Middle_Deschutes/default.aspx (last visited June 4, 2010).

60. *See* Columbia River Basin Fish and Wildlife Program Introduction, <http://www.nwcouncil.org/library/2003/2003-20/default.htm> (last visited Jan. 10, 2010); *see also*, MICHAEL C. BLUMM, *SACRIFICING THE SALMON: A LEGAL AND POLICY HISTORY OF THE DECLINE OF COLUMBIA BASIN SALMON* (2002).

acquired for the first 20 years of the program, even after many Columbia Basin salmon were listed under the Endangered Species Act.⁶¹ Recognizing the lack of success in streamflow restoration, in 2000, the National Marine Fisheries Service's Biological Opinion on operation of the federal Columbia River hydroelectric system specifically required the Bonneville Power Administration ("BPA") to increase tributary flows by experimenting with transactional strategies and competitive markets.⁶²

In response, BPA and the Council formed the Columbia Basin Water Transfer Program ("CBWTP") in 2002, which has successfully implemented a variety of innovative, voluntary, grassroots water transactions that improve river, stream, and tributary flow.⁶³ The program, managed by the National Fish and Wildlife Foundation, receives transaction proposals and then evaluates and ranks them across several criteria.⁶⁴ These projects come from specific "qualified" local entities and eleven partner organizations working throughout the Columbia Basin in Idaho, Oregon, Montana, and Washington.⁶⁵ The CBWTP has funded over 227 water restoration projects to date.⁶⁶

4. Klamath Basin Rangeland Trust

The mission of the Klamath Basin Rangeland Trust ("KBRT") is to restore and conserve water quality and quantity in Oregon's Wood

61. NAT'L MARINE FISHERIES SERV., BIOLOGICAL OPINION ON THE REINITIATION OF CONSULTATION ON OPERATION OF THE FEDERAL COLUMBIA RIVER POWER SYSTEM, INCLUDING THE JUVENILE FISH TRANSPORTATION PROGRAM, AND 19 BUREAU OF RECLAMATION PROJECTS IN THE COLUMBIA BASIN (2000).

62. *Id.* at 9-134.

63. Columbia Basin Water Transactions, The Program, <http://www.cbwtp.org/jsp/cbwtp/program.jsp> (last visited June 4, 2010).

64. See Columbia Basin Water Transactions Program, Criteria for Evaluating Proposals to Secure Tributary Water, http://www.cbwtp.org/partners/Criteria_02_12_04.htm (last visited June 4, 2010).

65. Columbia Basin Water Transactions Program, Partners, <http://www.cbwtp.org/jsp/cbwtp/program/partners.jsp> (last visited June 4, 2010). Also, the Deschutes River Conservancy and the Freshwater Trust are qualified local entities participating in the CBWTP.

66. JARED HARDNER & R.E. GULLISON, INDEPENDENT EXTERNAL EVALUATION OF THE COLUMBIA BASIN WATER TRANSACTIONS PROGRAM (2003-2006) 10 (Oct. 2007), *available at* <http://www.nwcouncil.org/fw/program/2008amend/cbwtp.pdf> (listing 153 water projects from 2003-2006); Nat'l Fish and Wildlife Found., Columbia Basin Water Transactions Program, http://www.cbwtp.org/jsp/cbwtp/query/select_fields.jsp (last visited May 13, 2010) (running query creates database showing 246 water restoration projects).

River Valley and the upper Klamath Basin.⁶⁷ This organization has specific goals of reducing cattle grazing to sustainable levels, increasing flow into the Upper Klamath Lake, and reestablishing specific wetlands in the area above the lake.⁶⁸ KBRT works with 13 landowners in the Wood River Valley to pilot land-and-water-management projects involving over 12,200 acres of rangeland.⁶⁹ Irrigation rights associated with the participating ranches are acquired and left instream. This significantly increases flows in Crooked Creek, the Wood River, Sevenmile Creek, and Fourmile Creek, to benefit a variety of endangered, threatened, and aquatic species.⁷⁰ Livestock herds on the participating properties were reduced by 80 percent relative to historic levels.⁷¹ Increased flows to Upper Klamath-Agency Lake also provide additional water to meet the demands of downstream fish, wildlife, and farming communities.⁷² The KBRT projects also provides significant water quality benefits and a 30 percent increase of flow into the Wood River Valley and Agency Lake.⁷³ The water left instream showed improvements in quality—lower temperatures and reduced nutrient loads—and riparian fencing allowed important riparian vegetation to reestablish.⁷⁴ The U.S. Bureau of Reclamation and the Natural Resource Conservation Service fund the landowner's water acquisitions and water quality improvement practices directly based upon the ecosystem services the landowners provide.⁷⁵

5. Bonneville Environmental Foundation

Regulation is not the only factor motivating purchasers of water restoration credits. Individuals are often concerned about the impact of their water use on the ecological health of their watershed. Some refer to this as a desire to be “water neutral.” Extracting water

67. Klamath Basin Rangeland Trust, Mission Statement, <http://www.kbrt.org> (last visited June 4, 2010).

68. *Id.*

69. KLAMATH BASIN RANGELAND TRUST, 2005 YEAR-IN-REVIEW 1 (2006), *available at* <http://www.kbrt.org/Files/KBRT%202005%20Year%20in%20Review.pdf>.

70. Klamath Basin Rangeland Trust, Year 2-2003 Projects, <http://www.kbrt.org/Page.asp?NavID=116> (last visited June 5, 2010).

71. *Id.*

72. KLAMATH BASIN RANGELAND TRUST, 2006 YEAR-IN-REVIEW 2 (2007), *available at* http://www.kbrt.org/Files/KBRT_Year-In-Review_2006%5B1%5D.pdf.

73. *Id.* at 4.

74. Klamation Basin Rangeland Trust, *supra* note 71.

75. *See* King, *supra* note 41 at 528 & n.159.

neutrally means that its “negative economic, social, and environmental externalities . . . are reduced as much as possible and that the remaining impacts are fully compensated.”⁷⁶ The Bonneville Environmental Foundation (“BEF”) now provides resources to help residential and commercial water users reduce their water use footprints⁷⁷ and develop water conservation and stewardship plans.⁷⁸ For water uses that users cannot reduce, BEF sells Water Restoration Certificates.⁷⁹ These certificates are designed to allow residents to take responsibility for their water consumption by paying BEF to assure that an equivalent amount of water is returned to the watershed.⁸⁰ Each certificate represents 1000 gallons of streamflow restoration and costs one dollar.⁸¹ In Oregon, BEF uses the money generated from selling these certificates to purchase restoration credits from the Deschutes River Conservancy and The Freshwater Trust for streamflow and watershed restoration in the Middle Deschutes River and Evan’s Creek.⁸² The National Fish and Wildlife Federation independently certifies these credits.⁸³

C. Water Quality

In the United States, water quality is primarily addressed through the Clean Water Act (“CWA”).⁸⁴ The Act’s regulatory focus is on discharges from point-source conveyances into navigable waterways.⁸⁵ The program, known as the National Pollutant

76. BONNEVILLE ENVTL. FOUND., *THE ROLE OF VOLUNTARY AND MARKET-BASED INITIATIVES IN FRESHWATER ECOSYSTEM RESTORATION* 9 (2009), available at <http://www.b-e-f.org/lib/pdf/BAFInal.pdf> (quoting ARJEN HOEKSTRA, *WATER NEUTRAL: REDUCING AND OFFSETTING THE IMPACTS OF WATER FOOTPRINTS* 5 (UNESCO-IHE, 2008)).

77. Bonneville Env’tl Found., *Renewable Energy*, <http://www.b-e-f.org/water/action> (last visited June 6, 2010).

78. See BONNEVILLE ENVTL. FOUND., *WATER STEWARDSHIP* 101, 3–7 (2009), available at <http://www.b-e-f.org/lib/pdf/BusinessWaterStewardship.pdf>.

79. Bonneville Env’tl Found., *Introducing BEF Water Restoration Certificates*, <http://www.b-e-f.org/blog/?p=1256> (last visited June 8, 2010).

80. *Id.*

81. Bonneville Env’tl Found., *Buying Blue Will Help Keep You Green*, <http://www.b-e-f.org/water/buy> (last visited June 6, 2010).

82. See Bonneville Env’tl Found., *Where the Healing is Happening*, <http://www.b-e-f.org/water/locations> (last visited June 6, 2010); Bonneville Env’tl Found., *Middle Deschutes River*, http://www.b-e-f.org/water/location/middle_deschutes (last visited June 6, 2010); Bonneville Env’tl Found., *Evans Creek*, http://www.b-e-f.org/water/location/evans_creek (last visited June 6, 2010).

83. BONNEVILLE ENVTL. FOUND., *supra* note 76, at 9.

84. See *Illinois v. City of Milwaukee*, 451 U.S. 304, 347 (1981).

85. 33 U.S.C. § 1342 (2006).

Discharge Elimination System (“NPDES”), requires all dischargers to meet uniform technology standards mandated by the U.S. Environmental Protection Agency (“EPA”).⁸⁶

During the early years of CWA implementation, the technology-forcing requirements of NPDES permits were the EPA’s focus. Water-quality standards were regarded as a safety net, in case technology-based effluent standards in permits were not sufficient to achieve designated beneficial uses. During the 1980s and 1990s states began to identify waters where technology-based pollution controls were insufficient to achieve the water bodies’ designated uses. This requires development of Total Maximum Daily Load (“TMDL”) allocations under the Clean Water Act § 303(d).⁸⁷ Once TMDLs are adopted, NPDES permits must include more stringent limits to ensure compliance with water quality.⁸⁸

However, in many cases, the reason water quality standards are not met is due to agricultural and urban runoff and other non-point sources of pollutants, which do not require NPDES permits.⁸⁹ Critics note that trying to achieve needed pollution reductions solely through NPDES permit conditions does not improve water quality efficiently.⁹⁰ Within one watershed different polluters may be able to reduce their discharges of a particular pollutant for very different costs. If affordable pollution reduction were the CWA’s primary goal, facilities with a higher marginal cost of pollution reduction could easily purchase the lowest cost reductions in the watershed, no matter the source.

Realizing the lack of flexibility inherent in the traditional regulatory program, the EPA issued a “Draft Framework for Watershed-Based Trading”⁹¹ in 1996. The EPA supplemented this framework in 2003 with a “Water Quality Trading Policy”⁹² aimed at reducing states’ costs of implementing TMDL requirements and

86. *Id.* §§ 1311(b), 1314(b), 1316.

87. *Id.* at 589, 684-85.

88. *Id.* at 661, 665; 33 U.S.C. § 1311(b)(1)(C).

89. *Id.* at 685.

90. *Id.* at 647.

91. U.S. ENVTL. PROTECTION AGENCY, DRAFT FRAMEWORK FOR WATERSHED-BASED TRADING, EPA 800-R-96-001 (May 1996).

92. U.S. ENVTL. PROT. AGENCY, FINAL WATER QUALITY TRADING POLICY (2003), available at <http://www.epa.gov/owow/watershed/trading/finalpolicy2003.pdf>.

allowing facilities discharging into the same waters to generate and trade credits.⁹³

1. Clean Water Services

Clean Water Services (“CWS”) is the water resources management agency for Washington County, Oregon, serving cities and towns west of Portland.⁹⁴ CWS received the first-ever fully integrated municipal NPDES permit on February 26, 2004.⁹⁵ Five permits—four wastewater treatment facilities and one urban stormwater management permit—were combined into one permit in a comprehensive approach to achieve water quality standards and to improve the overall health of the Tualatin River watershed.⁹⁶ The new permit allowed trading of water quality credits based on temperature (thermal load), oxygen-demanding chemicals, and other pollutants to help achieve water quality goals.⁹⁷ The goal of such trading is to allow “1) greater coordination of watershed protection and enhancement programs; 2) greater coordination of watershed assessment and monitoring activities; and 3) greater public involvement.”⁹⁸ The trades do not have to rely on credits generated by the permitted facilities; for instance, to meet temperature goals, a treatment facility may balance the heat it releases by planting new trees in rural riparian areas which provide cooling shade.⁹⁹ The CWS permit epitomizes the promise of ecosystem service markets. The agency would have had to refrigerate its wastewater discharges to meet the instream temperature standard. By investing in riparian restoration, the agency saved money, reduced energy use and achieved habitat restoration co-benefits.¹⁰⁰

93. *Id.* at 6–7.

94. Clean Water Serv., Your Clean Water Utility, <http://www.cleanwaterservices.org/AboutUs/OurStory> (last visited June 7, 2010).

95. INST. FOR NATURAL RES., POLICY CORNERSTONES AND ACTION STRATEGIES FOR AN INTEGRATED ECOSYSTEM MARKETPLACE IN OREGON 6 (2008).

96. DEP’T OF ENVTL. QUALITY, NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM WATERSHED-BASED WASTE DISCHARGE PERMIT, Nos. 101141, 101142, 101143, 101144 & MS4, *available at* <http://www.epa.gov/npdescan/OR0028118FP.pdf>.

97. *Id.* at 42–45.

98. *Id.* at 1.

99. *Id.* at 27–28.

100. *See* ERNIE NIEMI, KRISTIN LEE, & TATIANA RATERMAN, NET ECONOMIC BENEFITS OF USING ECOSYSTEM RESTORATION TO MEET STREAM TEMPERATURE REQUIREMENTS 2–3 (2007), *available at* http://www.econw.com/reports/Economic-Benefits-Ecosystem-Restoration_ECONorthwest.pdf.

The successes of CWS helped set the stage for further focus on water quality trading. In 2007, the EPA issued its own water quality “trading toolkit” manual explaining how to design and implement water quality trading schemes.¹⁰¹ The Oregon Department of Environmental Quality (“ODEQ”) has also proposed new guidance to encourage and expand water quality trading.¹⁰² Because warm streams are a limiting factor for salmon recovery, ODEQ has also created the “Shade-a-Lator” worksheet. This calculates temperature credits generated by riparian shade restoration, allowing sellers of ecosystem services to create tradable temperature credits at lower costs.¹⁰³

D. Land Banking for Wetlands and Habitat

Land development over centuries has significantly reduced fish and wildlife habitat. Traditional land trusts, like The Nature Conservancy, pioneered the practice of acquiring land to protect its biodiversity value. Two federal statutes touch directly upon ecologically valuable lands: wetlands are governed by CWA and its regulations,¹⁰⁴ and modification to some terrestrial habitats are protected under the Endangered Species Act (“ESA”).¹⁰⁵ In response to the costly restrictions these acts can impose, markets for mitigation credits have begun to develop. These markets—or banks—sell credits to developers to mitigate for the impacts their projects have on wetlands or endangered species habitat. This type of land banking attempts to convert ecological functions to a tradable currency, so that restoration in one area can generate mitigation credits that can be applied to other locations or sold to developers.

101. U.S. ENVTL. PROT. AGENCY, WATER QUALITY TRADING TOOLKIT FOR PERMIT WRITERS (2007), *available at* <http://www.epa.gov/npdes/pubs/wqtradingtoolkit.pdf>. The toolkit and its supplement cite Clean Water Services’ pollutant trading scheme as a model example several times.

102. OR. DEP’T OF ENVTL. QUALITY, WATER QUALITY TRADING IN NPDES PERMITS INTERNAL MANAGEMENT DIRECTIVE 13–14 (2009), *available at* <http://www.deq.state.or.us/WQ/pubs/imds/wqtrading.pdf>.

103. Or. Dep’t of Env’tl. Quality, Water Quality Trading, <http://www.deq.state.or.us/wq/trading/trading.htm> (last visited June 6, 2010); Or. Dep’t of Env’tl. Quality, Water Quality: Temperature, willamettepartnership.org/ecosystem-credit-accounting/water-quality-temperature (last visited June 6, 2010).

104. 33 U.S.C. § 1251 (2006); 40 C.F.R. §§ 230, 232 (2009).

105. Endangered Species Act, 16 U.S.C. § 1538 (2006).

1. Wetlands Mitigation Banking

Wetlands provide many services to humans, including water retention, soil formation, recreation, erosion control, nutrient cycling, pollination of crops, and endangered species habitat. In the continental United States, more than half of the historically existing wetlands have been drained, filled, or destroyed by agriculture, urban and rural development, and river and flood control projects.¹⁰⁶ Section 404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers (“the Corps”) to issue permits allowing wetland filling.¹⁰⁷ Since 1990, the EPA and the Corps have required “no net loss” of wetland acreage.¹⁰⁸ To meet this goal, developers are required to first avoid filling wetlands and then to minimize its effects. Only unavoidable effects can be mitigated through wetland restoration in the area.¹⁰⁹ After limited success through project-by-project, on-site compensatory mitigation, in 1995 the federal agencies began allowing banking of wetlands mitigation credits.¹¹⁰ These regulations under section 404(b)(1) allow for “compensatory mitigation to offset unavoidable damage to wetlands and other aquatic resources.”¹¹¹ This guidance gave state agencies, local governments, and the private sector the regulatory certainty and procedural framework they needed to approve and operate mitigation banks.¹¹²

Trading in wetlands banks soon became robust, making wetland banks the most mature form of habitat banking. In wetland mitigation banks, by restoring the values of a wetland, the landowner generates credits that they can sell to developers who need to offset unavoidable wetland impacts.¹¹³ But these trades often rely on safe havens based on simple acre-to-acre mitigation ratios that ignore preserving the functions that make wetlands valuable.¹¹⁴ While

106. PAUL F. SCODARI, MEASURING THE BENEFITS OF FEDERAL WETLANDS PROGRAMS 10–13 (1997).

107. Clean Water Act, 33 U.S.C. § 1344 (2006).

108. U.S. ENVTL. PROT. AGENCY, MEMORANDUM OF AGREEMENT BETWEEN THE ENVIRONMENTAL PROTECTION AGENCY AND THE DEPARTMENT OF THE ARMY CONCERNING THE DETERMINATION OF MITIGATION UNDER THE CLEAN WATER ACT SECTION 404(B)(1) GUIDELINES § IIIB (1990).

109. *Id.* at § II C.

110. *See* Federal Guidance for the Establishment, Use, and Operation of Mitigation Banks, 60 Fed. Reg. 58605 (Nov. 28, 1995).

111. *Id.* at 58606.

112. *Id.* at 58605–14.

113. *See id.* at 58606..

114. *See* NAT’L RESEARCH COUNCIL ET AL., COMPENSATING FOR WETLAND LOSSES UNDER THE CLEAN WATER ACT 138-68 (2001) (analyzing strengths and weaknesses of ongoing

wetlands provide a variety of ecological services, the early use of wetland markets relied upon very few of these.¹¹⁵

The EPA and the Corps have the authority to allow the exchange and banking of wetlands services, rather than mere acreages.¹¹⁶ In 2008, EPA and the Corps issued revised regulations governing compensatory mitigation.¹¹⁷ These regulations establish standards for mitigation banks, in-lieu fee mitigation, and permittee-responsible mitigation.¹¹⁸

Oregon's Department of State Lands ("ODSL") issues fill and removal permits for wetlands under state law.¹¹⁹ The Corps administers the federal 404 program in Oregon, but in many cases the agencies operate cooperatively.¹²⁰ ODSL adopted guidelines similar to the federal guidelines in 1996.¹²¹ The Corps and ODSL oversee bank plans and release credits to wetlands bankers only after bank owners meet performance measures and arrange to fund, maintain, manage, and monitor the wetlands in perpetuity.¹²² ODSL encourages potential bank owners to establish mitigation banks in watersheds where there is a large amount of development activity, "so that it is positioned to provide 'in-kind' mitigation for these anticipated wetland impacts."¹²³ Such preferred bank sites assure that bank owners are preserving wetlands of the same type, function, and service area as those in the path of development in the region. Good locations for banks are sites adjacent or close to other protected natural-habitat areas such as refuges, river corridors, and floodplains

mitigation projects and recommending, *inter alia*, a watershed approach, focusing on ecological performance criteria, better accounting for temporal lags and long term obligations); James Salzman & J.B. Ruhl, *Currencies and the Commodification of Environmental Law*, 53 STAN. L. REV. 607, 665-66 (2000).

115. *Id.* at 612.

116. See J.B. Ruhl & R. Juge Gregg, *Integrating Ecosystem Services into Environmental Law: A Case Study of Wetland Mitigation Banking*, 20 STAN. ENVTL. L.J. 365, 372-78 (2001) (finding that CWA § 404 and subsequent regulations and guidelines all provide ample authority and encouragement for considering ecosystem services but fail to require it).

117. Compensatory Mitigation for Losses of Aquatic Resources, 73 Fed. Reg. 19594 (April 10, 2008).

118. See *id.*

119. OR. REV. STAT. §§ 196.600-692., 196.800-990.

120. Or. Dep't of State Lands, Oregon Removal-Fill Program, <http://www.oregon.gov/DSL/PERMITS/r-fintro.shtml> (last visited June 8, 2010).

121. OR. ADMIN. R. 141-085-0680-0760 (2010).

122. See MITIGATION BANKING GUIDEBOOK COMM., WETLAND MITIGATION BANKING GUIDEBOOK FOR OREGON § 4.4 - 5 (2000), available at http://www.oregon.gov/DSL/PERMITS/docs/mitbank_guidebk.pdf.

123. *Id.* at § 2.4.

where they will create the least conflict with existing uses.¹²⁴ Oregon currently has 15 approved wetland mitigation banks,¹²⁵ with an additional seven proposed banks under review.¹²⁶

2. Oregon Bridge Program Comprehensive Mitigation and Conservation Strategy

Roads and highways shape our communities and link us together; however, they slice natural systems into pieces, destroying habitat and disrupting a wide array of ecosystem services.¹²⁷ State departments of transportation must comply with a wide variety of environmental laws and regulations when they build, maintain and operate state highway systems. Since at least 1990, the Oregon Department of Transportation (“ODOT”) has tried to streamline highway project permitting and reduce costs while effectively mitigating unavoidable wetland impacts, facilitating priority ecological restoration and species recovery, creating ecologically sound and sustainable mitigation, and conserving resources.¹²⁸

From 2001 to 2003, ODOT realized that hundreds of its concrete bridges had developed cracks, requiring them to be replaced or repaired.¹²⁹ This resulted in the \$1.3 billion Bridge Delivery Program.¹³⁰ Upgrading and repairing 300 bridges in eight years¹³¹ requires permits under the Endangered Species Act,¹³² the Clean

124. OR. ADMIN. R. 141-085-0565 (2010).

125. Or. Dep’t of State Lands, Mitigation Bank Regions and Contact Information, http://www.oregon.gov/DSL/PERMITS/mitbank_status.shtml (last visited Jan. 10, 2010).

126. *Id.*

127. *See generally* RICHARD T.T. FORMAN ET AL, ROAD ECOLOGY: SCIENCE AND SOLUTIONS (2003); DEFENDERS OF WILDLIFE, GETTING UP TO SPEED: A CONSERVATIONIST’S GUIDE TO WILDLIFE AND HIGHWAYS (2007).

128. LISA GAINES & SUSAN LURIE, INNOVATION IN ENVIRONMENTAL STREAMLINING AND PROJECT DELIVERY: THE OREGON STATE BRIDGE DELIVERY PROGRAM 3, 27, SR 500-151 (2007), *available at* http://www.inr.oregonstate.edu/download/Streamlining_Jan07.pdf (briefly discussing Oregon’s Comprehensive Environmental and Transportation Agreement on Streamlining, an 11-state-and-federal-agency program designed to streamline NEPA review); *see also* CONNIE OZAWA & JENNIFER DILL, AN EVALUATION OF THE OREGON DEPARTMENT OF TRANSPORTATION’S (ODOT) ENVIRONMENTAL STREAMLINING EFFORTS: A FOCUS ON CETAS (2005).

129. *See* GAINES & LURIE, *supra* note 128, at 11.

130. OR. DEP’T OF TRANSP., CONTEXT SENSITIVE AND SUSTAINABLE SOLUTIONS (CS³) GUIDEBOOK: COMMUNITY VALUES SHAPING A NEW GENERATION OF BRIDGES 2 (2005), *available at* <http://www.obdp.org/files/partner/cs3/cs3-guidebook.pdf>.

131. Or. Dep’t of Transp., OTIA III State Bridge Delivery Program, http://egov.oregon.gov/ODOT/HWY/OTIA/odotbridgesee_regs.shtml (last visited Apr. 1, 2010).

132. 16 U.S.C. § 1531 *et seq.*

Water Act,¹³³ and compliance with the National Environmental Policy Act.¹³⁴ This project put the agency's prior work on permit streamlining to the test. ODOT and the regulatory agencies realized that business as usual would not work.

To speed up permitting and improve environmental outcomes, ODOT developed a "comprehensive mitigation-banking program" to provide mitigation credits for unavoidable construction impacts.¹³⁵ To minimize impacts first, ODOT developed a set of environmental performance standards addressing species and habitat avoidance, water quality, and site restoration.¹³⁶ For unavoidable impacts, most mitigation programs explicitly prefer on-site mitigation, even though such mitigation is often difficult to develop, expensive, and may be of little long-term ecological value.¹³⁷ In this case, however, the Mitigation and Conservation Bank Review Team ("MCBRT"), made up of representatives from eight state and federal agencies,¹³⁸ instead decides where mitigation will be most effective on a site-by-site basis.¹³⁹

Unlike many wetland banking programs based on pure acre-for-acre "no net loss" mitigation, the MCBRT targets the recovery of ecosystems and lost habitat functions.¹⁴⁰ The programmatic Biological Opinion issued to ODOT in 2004 for the Bridge Program explains how ODOT plans to use "habitat banking concepts" in habitat management areas.¹⁴¹ Development approval relies upon on a "multi-

133. 33 U.S.C. § 1251 *et seq.*

134. 42 U.S.C. § 4321 *et seq.*

135. Or. Dep't of Transp., *supra* note 131.

136. GAINES & LURIE, *supra* note 128, at 19–20, app. A-2; OR. DEP'T OF TRANSP., OTIA III STATE BRIDGE DELIVERY PROGRAM ENVIRONMENTAL PERFORMANCE STANDARDS 14–30 (2005), available at http://www.obdp.org/files/partner/environmental/EPS_REG.pdf.

137. James Salzman, *Valuing Ecosystem Services*, 24 ECOLOGY L.Q. 887, 894–96, 895 n.17 (1997).

138. GAINES & LURIE, *supra* note 128, at 31.

139. OR. DEP'T OF TRANSP., COLLABORATIVE ENVIRONMENTAL AND TRANSPORTATION AGREEMENT FOR STREAMLINING: PROGRESS REPORT—AUGUST 2007 TO AUGUST 2008 APPROVED WORK PLAN—SEPTEMBER 2008 TO SEPTEMBER 2010, at 21 (2008), available at ftp://ftp.odot.state.or.us/techserv/Geo-Environmental/Environmental/Other Environmental Materials/CETAS/Annual Reports and Work Plans/2008_2010_Workplan/CETAS_2008-2010_Work_Plan_AdoptedFinal.pdf.

140. OR. DEP'T OF TRANSP., *supra* note 130, at 52; GAINES & LURIE, *supra* note 128, at 20.

141. U.S. FISH & WILDLIFE SERV. & NAT'L OCEANIC & ATMOSPHERIC ADMIN., NOAA FISHERIES NWR 2004/00209 & USFWS FILE #8330.02233 (04), ENDANGERED SPECIES ACT—SECTION 7 CONSULTATION, INFORMAL CONCURRENCE AND FORMAL BIOLOGICAL OPINION AND CONFERENCE & MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT: ESSENTIAL FISH HABITAT CONSULTATION, OREGON DEPARTMENT OF

resource mitigation debit and credit system.”¹⁴² Prioritization of ecosystem conservation needs helped identify regionally significant mitigation alternatives that contribute most to the recovery of habitats and species. ODOT has been able to achieve cost-effective and ecologically meaningful mitigation by addressing these needs at ODOT bank sites.¹⁴³ “The Habitat Accounting Method helps to accurately measure ecological functions providing better accounting of impacts and restoration efforts.”¹⁴⁴ The MCBRT has established three banks for wetlands and endangered species habitat in the Lost River, Crooked River, and Medford Vernal Pools in the Agate Desert.¹⁴⁵ It has also identified two other potential bank locations in Mirror Lake and East Fork Minnow Creek.¹⁴⁶

An independent evaluation of ODOT’s use of wetlands and habitat banks, as well as outcome-based performance measures, in the Bridge Program concluded that it led to a 3:1 return on investment for the agency, in addition to improved environmental outcomes.¹⁴⁷

E. Integrated Ecosystem Services Marketplace

The goal of building an integrated ecosystem marketplace is to attain broader and more effective conservation and restoration, rather than the fragmented permit-by-permit approach required by existing laws and regulations requiring separate credits for carbon, streamflow, water quality and habitat. Integrated market development will require a new suite of tools tied to strategic ecological priorities and market-based incentives. The thesis is that

TRANSPORTATION’S OTIA III STATEWIDE BRIDGE DELIVERY PROGRAM 36 (Jun. 28, 2004), available at [ftp://ftp.odot.state.or.us/techserv/Geo-Environmental/Environmental/Regulatory%20Documentation%20Forms%20and%20Examples/Biology/Programmatic%20Biological%20Opinions/OTIA%20III%20Bridge%20Replacement%20Biological%20Assessment/Biological%20Opinion.pdf](http://ftp.odot.state.or.us/techserv/Geo-Environmental/Environmental/Regulatory%20Documentation%20Forms%20and%20Examples/Biology/Programmatic%20Biological%20Opinions/OTIA%20III%20Bridge%20Replacement%20Biological%20Assessment/Biological%20Opinion.pdf).

142. GAINES & LURIE, *supra* note 128, at 20–21.

143. *Id.* at 44–46.

144. U.S. Dep’t of Transp., Oregon’s Ecosystem-Based Approach to Mitigation and Conservation Banking, <http://www.environment.fhwa.dot.gov/ecosystems/eei/or06.asp> (last visited May 18, 2010).

145. *Id.*; U.S. Fish & Wildlife Serv., Oregon’s First Conservation Bank, <http://www.fws.gov/oregonFWO/LandAndWater/ConservationPlanning/ConservationBank.asp> (last visited Apr. 1, 2010).

146. OR. DEP’T OF TRANSP., *supra* note 139, at 23–24.

147. OR. DEP’T OF TRANSP., ENVIRONMENTAL PROGRAMMATIC PERMITTING BENEFIT/COST ANALYSIS (Oct. 2008) (on file with the authors).

the more readily ecological services can be assessed, the more readily they can be valued and protected.

1. Willamette Partnership

In addition to the individual Oregon resource programs described above, the Willamette Partnership is working to build the infrastructure to operate an integrated, multi-credit market that will create and sell credits for a wide range of ecosystem services.¹⁴⁸ The Willamette Partnership is a broad-based coalition of stakeholders committed to restoring the health of the ecologically, socially, and economically complex Willamette Valley. This 11,500 square mile watershed contains the cities of Portland, Eugene, Salem, and Corvallis, 2.5 million people, and 75 percent of Oregon's economic activity.¹⁴⁹ The Willamette Partnership recognized the need for a coordinated approach that focuses public and private investments on strategic actions that support ecosystem-based improvements. To address this need, it launched the "Counting on the Environment" program with Natural Resource and Conservation Service funding.¹⁵⁰ The program seeks to encourage participation in market-based conservation efforts by developing model agreements with federal, state, and local agencies; user-friendly resource calculating tools¹⁵¹; multiple-credit accounting systems; and understandable crediting protocols.¹⁵² These systems are designed to provide the infrastructure needed to support multi-resource credit sales. The ecosystem service markets developed so far support four credit types—salmonid habitat, wetlands, upland prairies, and riparian shading (temperature

148. See Willamette P'ship, The Willamette Partnership, <http://www.willamettepartnership.org> (last visited June 6, 2010).

149. Willamette P'ship, About the Willamette Basin, <http://www.willamettepartnership.org/about-the-willamette-basin> (last visited June 6, 2010).

150. Nat. Resources Conservation Serv., Conservation Innovation Grants Awards—National Component Awards—Fiscal Year 2007 (NRCS), *available at* http://www.nrcs.usda.gov/programs/pdf_files/FY_2007_Conservation_Innovation_Grants_Projects.pdf; Willamette P'ship, Counting on the Environment, <http://www.willamettepartnership.org/ongoing-projects-and-activities/nrcs-conservation-innovations-grant-1/counting-on-the-environment> (last visited Apr. 1, 2010).

151. Willamette P'ship, Ecosystem Credit Accounting, <http://willamettepartnership.org/ecosystem-credit-accounting> (last visited Apr. 1, 2010); Willamette P'ship, Protocols, Tools and Templates, <http://www.willamettepartnership.org/tools-templates> (last visited Apr. 1, 2010).

152. See generally, WILLAMETTE P'SHIP, ECOSYSTEM CREDIT ACCOUNTING: PILOT GENERAL CREDITING PROTOCOL: WILLAMETTE BASIN VERSION 1.1 (2009), *available at* <http://willamettepartnership.org/ecosystem-credit-accounting/willamette-ecosystem-marketplace-documents/General%20Crediting%20Protocol%207.20.09.pdf>.

credits)—with more credits to be developed later.¹⁵³ The Willamette Partnership expects these tools to improve the ecological effectiveness of mitigation expenditures from factories, developers, transportation agencies, cities, and sewer and water ratepayers.¹⁵⁴ The current lack of well-organized markets also inhibits the conservation options for farmers, ranchers, and landowners. With a functioning market for services, they could provide additional ecosystem services on their lands, diversifying and increasing their incomes through conservation investments. Because it is integrated and will involve many types of credits—and many types of buyers and sellers—this developing ecosystem marketplace should expect to create and drive restoration projects that are more comprehensive than any one party or exchange can accomplish alone.¹⁵⁵ No other markets, nationally or internationally, have attempted to be as comprehensive, integrated, and ecosystem-focused as the Willamette Ecosystem Marketplace.

It is one thing to develop the theoretical constructs and plans for an ecosystem market, but the Willamette Partnership is working to ensure that state and federal agencies will independently approve and verify owners' credits.¹⁵⁶ Currently, pilot projects using these guidelines and credits are under development.¹⁵⁷

2. The Freshwater Trust

In addition to restoring streamflows as described above, The Freshwater Trust has developed the StreamBank program, a “web tool that enables landowners and restoration professionals to efficiently permit and fund a restoration project.”¹⁵⁸ It aims to lower transaction costs by helping potentially shovel-ready restoration

153. *See id.* at 1.

154. WILLAMETTE P'SHIP, ORGANIZING THE DEVELOPMENT AND IMPLIMENTATION OF THE WILLAMETTE ECOSYSTEM MARKETPLACE 1–2, *available at* <http://willamettepartnership.org/publications/MarketplacePubs/OrganizingDevelopmentandImplementationoftheWillamette....pdf>.

155. WILLAMETTE P'SHIP, DEVELOPING THE WILLAMETTE ECOSYSTEM MARKETPLACE 15 (2008).

156. WILLAMETTE P'SHIP, *supra* note 152, at 21–24.

157. Willamette P'ship, Pilot Projects, <http://www.willamettepartnership.org/ecosystem-credit-accounting/pilot-projects> (last visited June 6, 2010).

158. FRESHWATER TRUST, CASE STUDY 2008: STREAMBANK: RESTORATION SIMPLIFIED 4 (2009), *available at* <http://www.thefreshwatertrust.org/sites/thefreshwatertrust.org/files/pdf/StreamBank%20Case%20Study%202008%20-%20Low%20Res.pdf>.

projects find government funding and overcome regulatory hurdles.¹⁵⁹ It requires restoration professionals to answer a series of project-specific questions, which StreamBank then matches with a “science-based prioritization scheme” and criteria for agency and private funding sources.¹⁶⁰ The web tool can also generate a budget and fill out permitting forms.¹⁶¹ Once a project is underway, the StreamBank program helps fund monitoring and reporting.¹⁶² In 2007, three pilot projects were processed in this system with another 17 initiated in 2008.¹⁶³ By creating such efficiencies, the Freshwater Trust should be able to meet more demand and at lower costs to both providers and purchasers of mitigation projects.

III. LESSONS LEARNED

A. Market Development Requires Experimentation

In science, experimentation begins with a hypothesis, followed by controlled situations that can measure the effect of one variable on another. In the realm of policy development, experimentation often takes the form of pilot projects. In the previous section, we discussed a variety of Oregon market experiments for carbon dioxide, water quantity, water quality, and land. While each example teaches us something new about structuring ecosystem markets, the greatest lesson may be recognition of the value of experimentation in developing fully functioning markets. Oregon is a fairly small state which makes it a good testing laboratory where people can and do learn from one another. Market experiments can demonstrate technical, social and political feasibility. Theories that a project will restore ecological services, that creating markets will maximize ecological gains for the lowest economic costs, or that buyers and sellers will actually enter new markets, require confirmation before they can be expanded. Experiments demonstrate whether projects will or will not be feasible in practice.

159. *Id.* at 6 (reporting on a survey that found “26% of restoration professionals’ workdays are spent securing permits or funding”).

160. *Id.* at 7.

161. *Id.*

162. *Id.*

163. *Id.* at 8, 11–24 (overview and details of 2008 projects).

1. Developing Supply and Demand

Markets cannot exist without willing buyers and sellers. Successful pilot projects can generate sufficient supply and demand to build markets, both for the specific currency traded and for the use of ecosystem service markets generally. Potential sellers of ecosystem services are land and resource owners, farmers, and even conservation organizations that generate credits by conserving, restoring, or creating ecosystem goods on their lands.¹⁶⁴ Potential buyers of ecosystem services can be regulated entities required to offset unavoidable ecological damages, voluntary buyers who want to invest in environmental restoration in high priority areas, or governments purchasing credits to support cost-effective conservation.¹⁶⁵

If an ecosystem market generates revenue for sellers, it encourages other sellers to enter the market and grow markets with credit-generating potential. For new suppliers to enter the market, they must not only see the potential for economic gains, they must also be convinced that transaction costs of financing, permitting and legal uncertainty do not outweigh the benefits. Even if they value conservation, only demonstrable, long-term, stable, and certain rewards will encourage landowners to encumber their land with long-term commitments. This was the problem with the DRC/Climate Trust Riparian Reforestation Project. The Climate Trust and the DRC expected to be able to create and sell \$780,000 in carbon offsets through a riparian reforestation project when they began the project in 2002.¹⁶⁶ By 2008, only \$233,333 of credits had been sold.¹⁶⁷ Many private landowners were unwilling to sign 50-year conservation easements for the restored riparian areas.¹⁶⁸

The Climate Trust was able to build carbon-offset markets in Oregon and elsewhere by using the Oregon statutory offset mandate to provide start-up funds.¹⁶⁹ This allowed it to hire the staff needed to

164. Willamette P'ship, Sellers: Who Are They?, <http://www.willamettepartnership.org/key-marketplace-participants/sellers-of-ecosystem-services> (last visited June 6, 2010).

165. Willamette P'ship, Buyers: Who are they?, <http://www.willamettepartnership.org/key-marketplace-participants/buyers-of-ecosystem-services> (last visited June 6, 2010).

166. Press Release, Climate Trust et al., The Climate Trust Awards Contract to the Deschutes Resources Conservancy to Capture Atmospheric Carbon through Riparian Reforestation (Aug. 7, 2002), available at <http://www.climatetrust.org/pdfs/The%20Climate%20Trust-Deschutes%20Press%20Release.pdf>.

167. The Climate Trust, *supra* note 16.

168. Personal experience of the author as Director of the DRC from 2000 to 2003.

169. See *supra* notes 15–16 and associated text.

buy carbon offsets and participate in international carbon markets.¹⁷⁰ They expanded the market by reaching beyond companies required to buy offsets for their Oregon power plants to others who voluntarily wanted to offset their carbon emissions, expanding the demand for the credits.¹⁷¹ Bonneville Environmental Foundation has built its portfolio by promoting voluntary purchases of ecosystem services, first by selling consumers “Green Tags” alongside products that would fund renewable energy¹⁷² and more recently by selling water restoration certificates.¹⁷³ The DRC started its market-based streamflow restoration work by investing its limited federal funds to buy or lease water for instream use from willing sellers, only later developing water banks to meet groundwater mitigation requirements.¹⁷⁴ In each of these cases, non-profit organizations started markets by purchasing ecosystem services from willing sellers to create the demand necessary to stimulate landowners to become sellers and suppliers of ecosystem credits.

Oregon’s experiments in ecosystem service markets demonstrate the importance of early adopters in the diffusion of innovation.¹⁷⁵ Clean Water Services is a large municipal wastewater and stormwater agency with a strong technical and policy staff.¹⁷⁶ Its board is the elected county commission.¹⁷⁷ Its longtime general manager served on the board of the Willamette Partnership and other basin-wide

170. See Climate Trust, *supra* note 15 (showing Climate Trust’s history); Climate Trust, Offset Quality Initiative & National Policy, http://www.climatetrust.org/oqi_national.html (last visited June 8, 2010).

171. See CLIMATE TRUST, CUSTOMIZED VOLUNTARY OFFSET PROGRAMS, *available at* <http://www.climatetrust.org/documents/REV.9crxBUSINESSFLYER.pdf>; Climate Trust, Voluntary Offset Work, <http://www.climatetrust.org/voluntaryOP.html> (last visited June 8, 2010).

172. See BONNEVILLE ENVTL. FOUND., GREEN TAGS—A NEW WAY TO MARKET RENEWABLE ENERGY 11 (2004), *available at* http://www.b-e-f.org/lib/pdf/BEF_new_re_product.pdf (reporting BEF’s first Green Tag transaction began in 2000).

173. Bonneville Envtl. Found., Introducing BEF Water Restoration Certificates (Jul. 29, 2009), <http://www.b-e-f.org/blog/?p=1256> (last visited June 8, 2010) (announcing start of water restoration certificates in July 2009).

174. Personal experience of the author as Director of the DRC from 2000 to 2003.

175. EVERETT M. ROGERS, DIFFUSION OF INNOVATIONS (1962).

176. Clean Water Servs., Departments, <http://www.cleanwaterservices.org/AboutUs/Departments/default.aspx> (last visited June 6, 2010); Clean Water Servs., Your Clean Water Utility, <http://www.cleanwaterservices.org/AboutUs/OurStory/default.aspx> (last visited June 6, 2010).

177. Clean Water Servs., Your Clean Water Utility, *supra* note 176; Washington County Ore., Board of Commissioners, <http://www.co.washington.or.us/BOC/> (last visited June 6, 2010).

restoration initiatives.¹⁷⁸ It had the resources and patience to pursue a new integrated NPDES permit, serving now as a model for similarly situated organizations.¹⁷⁹ In the Klamath Basin, it was only after the founders of the KBRT demonstrated on their own property that they could reduce irrigation, change grazing practices, and stay in business that other landowners were willing to sign up for the program.¹⁸⁰ The DRC took several years to move beyond small, voluntary water leasing programs to robust water banking after landowners realized they could help restore streamflows and still have sufficient water to grow crops and operate irrigation districts.¹⁸¹

Market experimentation can also build supply and demand by demonstrating economic feasibility. Economic feasibility concerns the cost-benefit analysis of each restoration or conservation project. Pilot projects create opportunities for credit-generating banks and land managers to invest in conservation and to demonstrate whether their financial projections were accurate, thereby improving the financial certainty for future projects. One of The Climate Trust's first carbon projects involved paying the City of Portland to establish a website for commuters to arrange their own carpools.¹⁸² While it clearly appeared to The Climate Trust to be a promising venture, after they spent \$120,000, expecting to offset 70,000 metric tons of carbon dioxide over ten years, the project generated only 3,075 tons of reductions in the first five years.¹⁸³ This was not a failure of science, but an estimation failure of the demand for carpooling and the costs of overcoming the public's lack of enthusiasm for the service. Whether it was a result of a miscalculation or over-exuberance, it is unlikely that The Climate Trust will soon repeat such a risky and uncertain investment.

178. Willamette P'ship, Board of Directors and Staff, <http://www.willamettepartnership.org/about-us/board-of-directors-and-staff> (last visited June 6, 2010).

179. See *supra* notes 101–102 and accompanying text.

180. Staff Report to KBRT Advisory Board, Fort Klamath, Oregon (2002).

181. Deschutes River Conservancy, Accomplishments, http://www.deschutesriver.org/About_Us/Accomplishments/default.aspx (last visited June 6, 2010) (showing water transfers, conservation, and leases accelerating in 2002, fully six years after DRC's founding).

182. Climate Trust, Internet-Based Carpool Matching, http://www.climatestrust.org/carpool_match.html (last visited June 6, 2010); CarpoolMatchNW, <http://www.carpoolmatchnw.org> (last visited June 6, 2010).

183. TODD WYNN, CASCADE POLICY INST., MONEY FOR NOTHING: THE ILLUSION OF CARBON OFFSETS 18–20 (2009), available at http://www.cascadepolicy.org/pdf/env/Climate_Trust_Audit_021009.pdf.

Publicized successes with experimental markets increase acceptance for markets providing ecosystem services, increasing the likelihood that buyers, sellers, and the public will demand policies that include valuing and paying for ecosystem services. All of the organizations in Oregon that are working to develop ecosystem markets make a point to publicize their work so that potential buyers and sellers are aware of the opportunities markets provide. Effective methods range from the webinars on new requests for proposals hosted by The Climate Trust to tried-and-true field trips hosted by KBRT, the Freshwater Trust, and the DRC.

Pilot projects also produce educational opportunities to inform the public about the value of ecosystem services. If through these experiments conservationists and governments can emphasize the many ways nature sustains and enriches well-being, conservation may be more broadly supported.¹⁸⁴ When minimizing and mitigating impacts on ecological services and using best ecological practices in land management are viewed as moral imperatives and mutually beneficial activities, rather than regulatory requirements and trade-offs between environmental and economic or social needs, then buying and selling ecological services may be pursued more broadly.

2. Building Institutional Capacity

Markets require certain fundamentals to function, such as recognized property rights to exchange, a legal ability to transfer the property rights, accounting systems and market makers (the people or entities that bring buyers and sellers together). Oregon's experiments in developing ecosystem service markets have benefited enormously from the non-profit entities described above. The Climate Trust, EcoTrust, BEF, KBRT, OWT, and the DRC have all advocated for laws and policies needed for markets and served as market makers.

The first requirement for any market is that the "good" being bought and sold be recognized as a property interest that can be transferred. The OWT and the DRC could not invest in streamflow restoration until Oregon state law was changed in 1987 to recognize instream water rights and allow traditional surface water rights to be acquired and transferred to instream use.¹⁸⁵ The Climate Trust and EcoTrust had to define what counted as a carbon offset for their purposes in a way that comported with a variety of young and

184. Paul R. Armsworth et al., *Ecosystem Service Science and the Way Forward for Conservation*, 21 CONSERVATION BIOLOGY 1383, 1383 (2007).

185. See *supra* notes 37–39 and accompanying text.

evolving requirements.¹⁸⁶ The credit or property interest being exchanged also needs to fit the particular marketplace. For example, when the OWT and the CBWTP started to acquire water rights for instream flow restoration, they initially tried to transfer irrigation rights permanently to instream use. Farmers and ranchers generally were unwilling to make permanent transfers. The markets only really grew when OWT and others began leasing water rights for fixed terms.¹⁸⁷

Excitement about creating more efficient mechanisms to reach environmental goals is often restrained by legal barriers. Often, once legislatures enact laws, administrators enact policies, and bureaucrats enact procedures, ossification takes place until the “processes begin taking on the same import as the law.”¹⁸⁸ Federal and state regulatory agencies have had to develop clear guidance defining mitigation credits under the CWA and the ESA. This is illustrated by the CWS experience (under the CWA)¹⁸⁹ and ODOT’s experience (with habitat mitigation banks).¹⁹⁰ Experimenting with markets may uncover previously unimagined flexibility in the law and assuage fears of potentially expensive regulatory delays and legal challenges. CWS, through its persistent work with the ODEQ and EPA, developed a way to meet water quality-based effluent limitations through a watershed-based NPDES permit.¹⁹¹

Market experiments should point out where further legal or regulatory changes are necessary to promote functioning ecosystem service markets. Experimentation can demonstrate that administrators are open to changing rigid processes to encourage flexible, outcome-based solutions, as was the case with the Oregon Bridge Program. Experimentation may also demonstrate to regulated industries and landowners how to cooperate to achieve

186. See CLARK S. BINKLEY ET AL., AN ECOSYSTEM-BASED FORESTRY INVESTMENT STRATEGY FOR THE COASTAL TEMPERATE RAINFORESTS OF NORTH AMERICA 14 (2006), available at http://www.ecotrust.org/forestry/investment_strategy.pdf (acknowledging Ecosystem Forest Management will need to comply with a variety of standards, including those developed by the Climate Trust).

187. Personal experience of the author as Director of the DRC from 2000 to 2003.

188. GAINES & LURIE, *supra* note 128, at 29.

189. See *supra* Part II.C.1.

190. See *supra* Part II.D.2.

191. See DEP’T OF ENVTL. QUALITY, NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM WATERSHED-BASED WASTE DISCHARGE PERMIT, Nos. 101141, 101142, 101143, 101144 & MS4, available at <http://www.epa.gov/npdescan/OR0028118FP.pdf>.

environmental goals at lower costs, bringing supply and demand to the market.

The Oregon and Pacific Northwest non-profits have all provided extensive technical assistance to both buyers and sellers of ecosystem credits, helping them understand what carbon offsets or mitigation credits or instream water rights are and how they can participate in markets. To some extent, they work like real estate agents, linking sellers and buyers, helping sellers develop transferable credits and providing buyers the assurance that they are getting what they pay for. The Freshwater Trust's Streambank system provides direct technical decision support to both buyers and sellers.¹⁹² All of these organizations work with buyers and sellers to take transactions through the wide variety of funding and permitting steps necessary to do transactions. This experience is vital for market building because it is only by doing transactions that buyers, sellers and market makers gain assurance that the market works.

3. Building Learning Networks

In Oregon and the Pacific Northwest, hundreds of citizens, agency personnel, businesses, and non-profits regularly get together and share what they have learned about ecosystem service markets. The best example of this is the well-organized group of qualified local organizations participating in the CBWTP.¹⁹³ They meet together quarterly to share best practices and data and study projects on the ground. The Willamette Partnership played a similar role as it engaged a broad variety of stakeholders in the development of its integrated water market.¹⁹⁴ The Northwest Environmental Business Council¹⁹⁵ regularly hosts conferences and workshops on ecosystem service markets. Innovation theory emphasizes the importance of such learning networks or communities, and experience to date in Oregon bears it out.¹⁹⁶ Key individuals and opinion leaders, who see

192. See generally, FRESHWATER TRUST, *supra* note 158 (showing benefits through a series of case studies to sellers, e.g. landowners and restoration professionals, and buyers, e.g. local coordinators and grant administrators).

193. Columbia Basin Water Transactions Program, Partners, *supra* note 65 (identifying 11 qualified local entities in Washington, Oregon, Montana, and Idaho).

194. Willamette P'ship, Broad Participation, Broad Benefits, <http://www.willamettepartnership.org/key-marketplace-participants> (last visited June 6, 2010).

195. Northwest Environmental Business Council, <http://www.nebc.org> (last visited June 4, 2010).

196. See ROGERS, *supra* note 175.

how carbon and instream water markets work, promote market approaches to habitat and other ecosystem services.

B. Market Development Requires Standards

It is essential to clearly and neutrally identify and quantify relationships (1) between development actions and required mitigation or offsets, and (2) between private sector landowners' restoration measures and the ecosystem services provided. Developing such standards for supply and demand requires advanced technical capabilities. First, baselines are needed to determine what services are provided under existing land management practices. Measuring environmental degradation and the debits that must be compensated may be relatively straightforward. The modeling and predictive ability needed to accurately develop and certify a seller's ecosystem credits is more challenging. Ecosystem service sellers will not manage their valuable lands for environmental services if they cannot be assured that they will receive credits, and the public interest of the trade will be lost if the ecosystem services promised do not materialize. Poor outcomes are also likely to erode public support for future efforts. Pilot projects, like those currently underway with the Willamette Partnership, are important to show scientific feasibility.

Without a technical underpinning for the market, negotiations, auctions, and trading platforms cannot begin. Because much of this technical knowledge and information technology infrastructure will serve both voluntary and regulatory markets, this is an important area for public-private partnership on financing, design and development.

1. Clear Property Interests

Experimental markets should address whether markets can effectively identify and commoditize ecosystem services. Are tradable ecosystem "currencies" adequately defined? Developing measurements, definitions, and procedures should help buyers and sellers understand these currencies and their risks and responsibilities before and after a sale. Such process manuals, currency development, and ecosystem measurement tools are a large aspect of the Willamette Partnership's nascent "Counting on the Environment" program.¹⁹⁷ Analyzing their success in developing currencies can begin once pilot projects are underway.

197. See *supra* note 150 and text accompanying notes 150–155.

2. Quantification and Valuation

Experimental markets should also demonstrate whether markets mechanisms are functioning, *i.e.*, is the interaction of supply and demand adequately reflected in prices?¹⁹⁸ There is no question that ecosystems generate service flows that can be quantified in economic value; what is less clear is how to create markets that will generate information about how much of a service needs to be protected and at what cost.¹⁹⁹ In some markets that will be easier to determine than in others. In cap-and-trade greenhouse gas markets, the government can set the amount of carbon dioxide reduction necessary and then auction units of carbon pollution to the regulated market place.²⁰⁰ The market is large with considerable supply and demand.

In water markets, water rights are held by a limited number of entities and can only be traded within a particular watershed, resulting in much less supply and demand and far fewer transactions. Early on, the OWT and the DRC developed systems for evaluating existing water rights' ability to restore instream flows at times and locations critical for aquatic habitat.²⁰¹ These evaluations were essential for early water market development. On paper, an existing water right may be for 5 cfs during the irrigation season, but it might not be delivered for that full amount during critical low water periods.²⁰² They now have analytic tools to determine for specific rivers the values of how "wet" the waterway really is.²⁰³

Early wetland mitigation banks overlooked the fact that wetland values can only be traded fairly once the currency's dimensions are defined: which functions must mitigation replace, at what scale, in what locations, and for whose benefit? Requiring wetland mitigation to match destroyed wetlands along numerous specific variables will

198. See, *e.g.*, James Salzman, Barton H. Thompson, Jr. & Gretchen C. Daily, *Protecting Ecosystem Services: Science, Economics, and Law*, 20 STAN. ENVTL. L.J. 309 (2001) (discussing the lack of "direct price mechanisms to signal the scarcity or degradation of . . . public goods" in a typical commercial market).

199. Salzman, *supra* note 137, at 889.

200. See, *e.g.*, Hirsch, *supra* note 8, at 627–28 (explaining specifically the Kyoto Protocol Clean Development Mechanism).

201. See Janet C. Neuman & Cheyenne Chapman, *Wading Into the Water Market: The First Five Years of the Oregon Water Trust*, 14 J. ENVTL. L. & LITIG. 135, 162–64 (1999) (explaining OWT's development of measurement protocols and tools).

202. See, *e.g.*, *id.* at 164–65 ("[N]eighboring water users are very wary of any transaction that simply leaves the entire amount of a water user's right in the stream, because doing so will disrupt the established pattern of diversions and return flows and possibly deprive other irrigators of flows in the stream at certain times of year.").

203. See *id.* at 162–64.

increase sellers' and buyers' assessment and monitoring costs and decrease the number of sellers who can match those functions.²⁰⁴ A prerequisite of trade is fungibility, and fungibility requires similarity.²⁰⁵ If trades do not capture the environmental and human values sought to be protected, those values become external to the exchange and cannot be assured by trading mechanisms.²⁰⁶ Consequently, wetlands regulators need to choose a defensible point along the spectrum from a robust market in ill-defined goods to an anemic market in a rigorously reviewed commodity.²⁰⁷ Environmental currencies must take into account both the interests of the transacting parties and the externalities relevant to social welfare.²⁰⁸ Perhaps recent rulemaking acknowledging ecosystem services directly²⁰⁹ will address some previous criticisms. But wetlands assessment methodologies need further testing to assure environmental effectiveness while avoiding raising transaction costs to levels that would prohibit trade.²¹⁰

Even as the new federal rule is being implemented, states may create their own guidelines furthering the experimentation by creating ecosystem services currency that retains fungibility and simplicity, while capturing the relevant values. Currently, the ODSL looks only to geographical range, hydrogeomorphic and Cowardin classes, and a wetlands-type multiplier ratio to calculate trade mitigation credits.²¹¹ New guidance on an Oregon Rapid Wetland

204. See Salzman & Ruhl, *supra* note 114, at 612.

205. *Id.* at 611.

206. *Id.* at 624.

207. *Id.* at 612.

208. *Id.* at 668–89.

209. Compensatory Mitigation for Losses of Aquatic Resources Final Rule, 73 Fed. Reg. 19,593 (Apr. 10, 2008) (modifying 33 C.F.R. pts. 325, 332 & 40 C.F.R. pt. 230).

210. See generally, James Murphy, Jan Goldman-Carter, & Julie Sibbing, *New Mitigation Rule Promises More of the Same: Why The New Corps and EPA Mitigation Rule Will Fail To Protect Our Aquatic Resources Adequately*, 38 STETSON L. REV. 311 (2009) (finding that mitigation has been a repeatedly failed promise, that the new rule retains the same loopholes, and that the Corps failure to adequately monitor, enforce, and encourage avoidance are the biggest threats to wetlands); J.B. Ruhl, James Salzman & Iris Goodman, *Implementing the New Ecosystem Services Mandate of the Section 404 Compensatory Mitigation Program: A Catalyst For Advancing Science And Policy*, 38 STETSON L. REV. 251 (2009) (finding that the new regulations acknowledge ecosystem services and move in the right direction, but that methods for measuring wetlands ecology, economics, and geography are not yet sufficiently robust).

211. Or. Dep't of State Lands, Mitigation Bank Regions and Contact Information, http://www.oregonstatelands.us/DSL/PERMITS/mitbank_status.shtml (last visited June 6, 2010); OR. DEP'T OF STATE LANDS, WETLAND MITIGATION BANKING GUIDEBOOK FOR OREGON §§ 4.2.1 – 4.2.8 (2000), available at http://www.oregon.gov/DSL/PERMITS/docs/mitbank_guidebk.pdf.

Assessment Protocol (“ORWAP”) has been released, which does not rely on acreage but a more sophisticated analysis of function and value done in term of “grouped services” like hydrologic function, water quality, fish, aquatic habitat, and terrestrial habitat, rather than on a single generic wetlands value.²¹² Looking at replacing functions is a good start, but thinking only about functions may alter *who* benefits from the associated ecosystem services, moving wetlands away from urban areas and into rural ones.²¹³ While ORWAP was designed mainly for developers, the Willamette Partnership’s crediting promotes using its Counting on the Environment methods to generate credits based on changes to wetland functions from an enhancement project and to determine priority locations for mitigation.²¹⁴

The Endangered Species Act generally prevents any action which would kill or injure a species in danger of extinction.²¹⁵ This includes any habitat modification that leads to any death or injury.²¹⁶ Consequently, many development projects around the nation could violate the Act. However, in 1982, Congress amended the ESA to allow the U.S. Fish and Wildlife Service (“USFWS”) to issue permits for an “incidental take” of a protected species.²¹⁷ To obtain an incidental take permit, an applicant must prepare a habitat conservation plan (“HCP”).²¹⁸ USFWS also allows use of habitat credits from conservation banks as reasonable and prudent actions in a “section 7 consultation” in accordance with the ESA.²¹⁹

USFWS recently began promoting market-based approaches for mitigation requirements, conditions of particular HCP permits, which

212. OR. DEP’T OF STATE LANDS, GUIDANCE FOR USING THE OREGON RAPID WETLAND ASSESSMENT

PROTOCOL (ORWAP) IN THE STATE AND FEDERAL PERMIT PROGRAMS 8 (2010), *available at* http://www.oregonstatelands.us/DSL/WETLAND/docs/orwap_guide.pdf.

213. Ruhl, Salzman & Goodman, *supra* note 210, at 262.

214. *See generally* WILLAMETTE P’SHP, WETLAND CREDITING PROCEDURE: TRANSLATING FUNCTIONAL SCORES TO CREDITS ACCOUNTING (2009), *available at* http://www.willamettepartnership.org/ecosystem-credit-accounting/orwap/WetlandCreditingProcedure_071309.pdf.

215. Endangered Species Act, 16 U.S.C. § 1538(a) (2006).

216. 50 C.F.R. §§ 17.21, 17.3.

217. Endangered Species Act Amendments of 1982, Pub. L. No. 97-304, 96 Stat. 1418 (1982); 16 U.S.C. § 1539(a).

218. 16 U.S.C. § 1539(a)(2)(A).

219. U.S. DEP’T OF THE INTERIOR, FISH AND WILDLIFE SERVICE, GUIDANCE FOR THE ESTABLISHMENT, USE, AND OPERATION OF CONSERVATION BANKS 3–4 (2003), *available at* <http://www.fws.gov/endangered/pdfs/MemosLetters/conservation-banking.pdf>.

include the use of habitat conservation banks.²²⁰ Conservation banks are parcels of land that are conserved and managed in perpetuity for conservation of the specified listed species. Such banks allow investors to assemble and restore prime habitat for endangered species to create “credits” that can be sold to developers who must mitigate habitat destruction as part of their HCP permit conditions or as an action required due to consultation under section 7 of the ESA.²²¹ In this market system, voluntary sellers hope to create marketable credits that can be sold at a profit to buyers, who seek to purchase credits for less than the cost of alternative mitigation and avoidance approaches. Federal agencies believe this will help assemble large permanently dedicated conservation sites with professional management.²²² As with wetlands banking, difficulties arise in trying to quantify habitat currencies for both restoration benefits and development impacts. USFWS plans to make mitigation credits available based on “habitat value conservation outcomes” and to encourage active management.²²³

Conservation banking for endangered species is at an early development stage in most places, although California has used them since the late 1990s.²²⁴ ODOT created Oregon’s first conservation bank to mitigate impacts of its bridge program on two endangered plants, Cook’s lomatium and the large-flowered woolly meadowfoam, as well as the threatened vernal pool fairy shrimp, a small, translucent crustacean.²²⁵ These species live in vernal pool habitat—small, shallow wetlands that fill with water during fall and winter rains and dry up in the spring and summer.²²⁶ These wetlands are very rare in Oregon and throughout the nation.

220. *Id.* at 7.

221. See J.B. Ruhl, *Regulation by Adaptive Management: Is It Possible?*, 7 MINN. J. L. SCI. & TECH. 21, 43 (2005).

222. *Id.* at 44.

223. Amy J. Dona, Note, *Crossing the Border: The Potential for Trans-Boundary Endangered Species Conservation Banking*, 16 N.Y.U. ENVTL. L.J. 655, 670–72 (2008).

224. See DOUGLAS P. WHEELER & JAMES M. STROCK, CAL. ENVTL. PROT. AGENCY, OFFICIAL POLICY ON CONSERVATION BANKS (1995), available at http://www.ceres.ca.gov/topic/banking/banking_policy.html; see also Fred Bosselman, *Swamp Swaps: The “Second Nature” of Wetlands*, 39 ENVTL. L. 577, 580 (2009).

225. Scott Learn, *ODOT Preserves Green Spaces to Offset Road-Building Damage*, THE OREGONIAN (Jul. 2, 2009), available at http://www.oregonlive.com/environment/index.ssf/2009/07/odot_preserves_green_spaces_to.html; see also *supra* notes 144–145.

226. See *id.*

In addition to being the first conservation bank in the state, the ODOT bank addresses wetland impacts.²²⁷ Federal and state agencies collaborated to make sure that approval of ODOT's conservation bank was subject to only one set of standards and procedures. This substantially reduced the time and effort spent having the bank approved and was an important factor in ODOT's willingness to become Oregon's pioneer conservation banker.²²⁸ ODOT's relatively new MCBRT is attempting to meet mitigation needs by working with the Willamette Partnership.²²⁹ The Willamette Partnership has developed a credit calculator for upland prairies²³⁰ that could generate credits to mitigate impacts to the endangered Fender's blue butterfly as part of a regional HCP.²³¹

3. Additionality and Multi-Credit Accounting

In order for markets to work, buyers and sellers of services must understand the rules that apply. This requires ecosystem service markets to define terms important to their growth. Additionality is the concept that credited ecosystem improvements must "represent an overall increase in, or a [measurable] avoided reduction of, ecosystem services, relative to those services that would have existed without creating the credits."²³² Obviously, landowners should not be able to generate salable credits for practices they were already undertaking or required by existing law to perform. Additionality has been an issue in many of the Oregon markets. For example, under the DRC/Climate Trust Riparian Reforestation project, the question arose as to whether a forest landowner required to retain trees in riparian areas under the Oregon Forest Practices Act²³³ should be allowed to sell offsets based on the carbon sequestered by those trees. The answer to that was "no," but credits could be created by reforesting denuded riparian areas.²³⁴

227. *Id.*

228. *See id.*

229. OR. DEP'T OF TRANS., *supra* note 139, at 22.

230. PAUL ADAMUS, PROCEDURE FOR UPLAND PRAIRIE CREDIT CALCULATOR (2009), available at http://www.willamettepartnership.org/ecosystem-credit-accounting/prairie/UplandPrairieMetricProcedure_071409.pdf.

231. Willamette P'ship, Upland Prairie Habitat, <http://www.willamettepartnership.org/ecosystem-credit-accounting/upland-prairie-habitat> (last visited May 12, 2010).

232. Willamette P'ship, A Glossary of Important Terms, <http://www.willamettepartnership.org/about-markets/glossary> (last visited June 6, 2010).

233. OR. REV. STAT. §§ 527.610 to .785 (2009).

234. Climate Trust, Deschutes Riparian Reforestation, <http://www.climatetrust.org/deschutes.html> (last visited June 7, 2010).

A subcategory of additionality is financial additionality. This refers to the ability of an ecosystem service seller “to demonstrate that absent payments for credits the benefits of the action that generated the credits would not have exceeded the costs.”²³⁵ If a practice is independently economically valuable, such as a forester who plants trees for future harvest, it is argued that the practice should not generate ecosystem service credits.²³⁶ Credits should be generated only when they truly provided the financial incentive to undertake the action. This issue also arose on the Deschutes Riparian Reforestation project. Participating landowners were required to grow trees longer than they normally would have in order to qualify for credits.²³⁷

Defining the difference between *credit stacking* and *double dipping* raises similar problems, especially for multi-credit markets. Credit stacking involves creating multiple, different types of ecosystem credits from the same geographical area, such as a parcel of land that contains both wetlands credits and habitat credits.²³⁸ Double dipping occurs when a single output generates multiple credits—such as a created wetland that generates wetland mitigation credits, water quality credits, carbon sequestration credits, and habitat conservation credits. The difference between credit stacking and double dipping is subject to a debate between accounting for all of the benefits of an ecosystem service and awarding a windfall to the parcel without any extra investment.²³⁹ Multiple credits from one site may be justified if calculated together, as is being done by the Willamette Partnership²⁴⁰ and the Oregon Bridge Program.²⁴¹ Unbundling and valuing separable functions of an ecosystem is not necessarily different from what real estate appraisers often do. What is important to keep in mind is the underlying objective of payments for ecosystem services: providing incentives for environmental investment that would not otherwise exist. Unless landowners are able to bundle the value of multiple credits, it may not be worthwhile

235. INST. FOR NAT. RES., *supra* note 95, at 30.

236. *See id.*, but see Sean Casten, *Does Additionality Matter*, GRIST (Mar. 27, 2008), available at <http://www.grist.org/article/carbon-policy-details-part-2>.

237. Personal experience of the author as Director of the DRC from 2000 to 2003.

238. INST. FOR NAT. RES., *supra* note 95, at 30.

239. *See* Alice Kenny, *When is Credit-Stacking a Double Dip?*, ECOSYSTEM MARKETPLACE (Nov. 16, 2009), available at http://www.ecosystemmarketplace.com/pages/dynamic/article.page.php?page_id=7147.

240. *See generally* WILLAMETTE PARTNERSHIP, *supra* note 151.

241. INST. FOR NAT. RES., *supra* note 128, at 19–20.

for them to invest in the environmental restoration needed to create the credits.

While recognizing the importance of defining key concepts, terms, and measurements so that credit purchasers and sellers can make equivalent trades, it is important not to mistake this for a need for global uniformity. Uniform federal or global standards are neither necessary nor appropriate in many markets. Ecosystem services often will require markets that are custom-designed for the particular participants and localities. The diversity of ecosystem services and types demands a diversity of standards and tools to measure and analyze those standards.²⁴² Standards must vary to match the type and scale of the market—public versus private, large basin versus small watershed, prairie versus wetlands. Ecotrust and the Climate Trust participate in international carbon markets complying with the rules and regulations that have been developed for them.²⁴³ Groups like KBRT, CWS, the Freshwater Trust, and the DRC operate in local markets, each with its own standards.

4. Geographic Scale

Geographic scale influences ecosystem service market development in several ways beyond market size. Clearly, a global carbon market is more likely to develop than a global habitat market for a highly localized, rare species. A less obvious geographic scale issue relates to the potential misalignment of buyers and sellers. For example, if development impacting wetlands occurs primarily in urbanizing areas, like Oregon's Willamette Valley, and the landowners interested in creating wetlands mitigation or restoration banks are in rural areas with limited hydrologic or biological connection to the impacted wetlands, the resulting mitigation banks are unlikely to create ecosystem services equivalent to those displaced. This is why ODSL is now promoting development of mitigation banks in rapidly developing areas.²⁴⁴

242. The Ecosystem-Based Management Tools Network website lists over 160 tools for managing coastal and marine resources. Ecosystem-Based Mgmt. Tools Network, EBM Tools Database, <http://www.smartgrowthtools.org/ebmtools/index.php> (last visited May 12, 2010). Their list represents only non-terrestrial land use applications and is not even exhaustive of all such tools in this category. Ecosystem-Based Mgmt. Tools Network, About EBM Tools, http://www.ebmtools.org/about_ebm_tools.html (last visited May 12, 2010).

243. See *supra* note 186 and accompanying text.

244. Personal conversation between the author and DSL Director, Louise Solliday, Fall 2009, Salem, Oregon.

Closely related to geographic misalignment of buyers and sellers are the problems posed by determining the appropriate market area for a mitigation or conservation bank. For example, in the Deschutes Groundwater Mitigation program, determining the “zone of influence” within which credits must be obtained was a contentious issue.²⁴⁵ Under federal wetland mitigation bank guidance, the same issue arises in defining appropriate geographic service areas.²⁴⁶

Geographic scale also has important implications in terms of ecological effects of the mitigation or conservation actions. Those entering the market as sellers, particularly at the early stage of market development, often do not own property where the most critical ecological resources are located. For example, the DRC started its water-leasing program with any landowner willing to lease water instream just to get water rights holders used to leasing their rights.²⁴⁷ The early leases were not prioritized or evaluated in terms of their impact on aquatic ecological function.²⁴⁸ With the development of the CBWTP, this changed, and all water acquisitions were prioritized and evaluated.²⁴⁹ Biodiversity conservation must occur at the landscape scale, yet market participants do not always align with landscape-scale conservation priorities. Adoption by all 50 states of formal State Wildlife Conservation plans²⁵⁰ should help address this problem.

C. Market Development Requires Accountability

Demonstrating feasibility requires information. During individual ecosystem service projects, data should be gathered about ecological benefits and the economic and operational systems needed for the market to function. When pilot projects are in the experimental phase, there are great opportunities for rigorous monitoring, but too often monitoring and data gathering are skipped. Yet, if more data is generated, pilot markets can be refined, and accounting and measurement systems can be improved.

Ecosystem market standards should not only facilitate trading, but they also should incorporate relevant values and be enforced to

245. See Pagel, *supra* note 55, at 30.

246. See Federal Guidance for the Establishment, Use and Operation of Mitigation Banks, 60 Fed. Reg. 58,605, 58,611 (Nov. 8, 1995).

247. Personal experience of the author as Director of the DRC from 2000 to 2003.

248. *Id.*

249. See HARDNER & GULLISON, *supra* note 66, at 3.

250. See State Wildlife Action Plans, <http://www.wildlifeactionplans.org/> (last visited June 7, 2010).

make certain the promised environmental benefits materialize. Overly simple (or inaccurate) currencies ignore a primary goal of environmental legislation: to force entities to internalize their externalities.²⁵¹ Externalities are the cost or benefits imparted to parties that are not directly involved in a transaction as a seller or buyer.²⁵² A common theme in ecosystem services markets is that *private uses*—those subject to controlled distribution, exclusion, and scarcity—allow for the easy determination of price and automatically create a dynamic market, while *public uses*—those which are often not excludable or rival—are often plagued by positive externalities that are not easily captured by market signals and are ignored unless government intervenes.²⁵³ If trades ignore or oversimplify the social costs imposed, these criteria will not be preserved. The public and environmental NGOs should expect trades to include meaningful ecosystem functions, to be subject to objective and meaningful monitoring and transparent data collection about trades, and to reassess their goals continually to assure they are being met.²⁵⁴

These concerns for standards that further the public interest have been partially addressed in Oregon by the nature of the entities establishing the markets. Many of the pilot Oregon markets are being initiated by environmental organizations, not by the regulated entities.²⁵⁵ The Freshwater Trust and the DRC are staffed by people who passionately care about using markets to achieve environmental

251. Although environmental economics is now a robust discipline, the first generation of United States environmental legislation was not based on economic theories and feasibility studies, but rather commands to industries to curb activities that threatened human health and the environment based on far-reaching public sentiment. Richard J. Lazarus, *The Greening of America and the Graying of United States Environmental Law: Reflections on Environmental Law's First Three Decades in the United States*, 20 VA. ENVTL. L.J. 75, 77–80 (2001).

252. The most salient externality is pollution, where neither the purchaser of the final product nor the producer who sells it directly pays for the pollution costs to health and environment imposed on society. Ecosystem services, on the other hand, are often positive externalities: the benefits they produce, e.g. photosynthesis or flood control, cannot readily be sold on the market. J.B. RUHL, STEVEN E. KRAFT & CHRISTOPHER L. LANT, *THE LAW AND POLICY OF ECOSYSTEM SERVICES* 65 (2007).

253. *Id.* at 64–65.

254. See Salzman & Ruhl, *supra* note 114, at 680.

255. The Climate Trust, Ecotrust, The Freshwater Conservancy, DRC, KBRT, BEF, and Willamette Partnership all are, or began as, private entities based on environmental concern. Even those organizations that started by governments or regulated entities, e.g. Bonneville Power Administration, and Clean Water Services, partner with environmental nonprofits. See *supra* Part II.

goals.²⁵⁶ The Willamette Partnership's protocols directly incorporate a "conflict of interest" check.²⁵⁷ As the government steps up its role to homogenize and formalize environmental service market standards, it must assure that the public interest continues to be met in those markets. This will require transparency of data collection, credit generation, and accounting. Government run or imposed markets also should include requirements for ongoing independent verification that the credits that are promised materialize. NGOs should continue to play a role in the generation, verification, and oversight of such credits. Lastly, governments should create procedures that allow NGOs and the public to challenge transactions that are fraudulent or detrimental to public interest and to hold legally responsible parties accountable.

The amount and type of monitoring and evaluation done on the Oregon projects has varied. The ODOT Bridge Program had its results reviewed independently by Oregon State University to evaluate its strengths and lessons learned and retained an independent third party to prepare a cost-benefit analysis of the program.²⁵⁸ ODEQ has reviewed the Tualatin River NPDES permit that it issued to Clean Water Services.²⁵⁹ The CBWTP was evaluated, as a program, by a third-party professional evaluation firm whose report was peer-reviewed by an academic panel.²⁶⁰ Ecotrust and The Climate Trust both require independent third party monitoring of projects that create carbon offsets.²⁶¹ The DRC has even paid for stream-gauging stations to assure that the water it leased actually was

256. Clicking through to the biographies of lead staff shows decades of environmental nonprofit experience. See Freshwater Trust, Staff, <http://www.thefreshwatertrust.org/who-we-are/staff> (last visited June 6, 2010); Deschutes River Conservancy, Staff, http://www.deschutesriver.org/About_Us/Staff/default.aspx (last visited June 6, 2010).

257. WILLAMETTE P'SHIP, ECOSYSTEM CREDIT REGISTRY CONFLICT OF INTEREST CODE (2008), available at http://www.willamettepartnership.org/tools-templates/wp_conflict_of_interest_code.pdf.

258. GAINES & LURIE, *supra* note 128.

259. OR. DEP'T OF ENVTL. QUALITY, WATER QUALITY CREDIT TRADING IN OREGON: A CASE STUDY REPORT (2007), available at <http://www.deq.state.or.us/wq/trading/docs/wqtradingcasestudy.pdf>.

260. See HARDNER & GULLISON, *supra* note 66; GAIL ACHTERMAN, SUSAN HANNA & NOELWAH NETUSIL, REPORT TO THE NORTHWEST PLANNING AND CONSERVATION COUNCIL ON THE EXTERNAL REVIEW OF THE COLUMBIA BASIN WATER TRANSACTIONS PROGRAM (2007), available at http://cbwtp.org/jsp/cbwtp/library/documents/CBWTP_report_Tech_Committee_FINAL.doc.

261. CLIMATE TRUST, 2006 ANNUAL REPORT 4 (2006), available at http://www.climatetrust.org/pdfs/Climate_Trust_Annual_Report_2006.pdf.

in the stream reach that it was intended to benefit.²⁶² It is important to note a distinction between monitoring and evaluation. Market makers or regulators need to monitor to make sure that specific projects are delivering the credits they have sold. They also need to evaluate their overall market programs to make sure the anticipated system-level results are being achieved.

D. Government Agencies Can Generate Demand

1. The Government as Standard Setters and Regulators

Because ecosystem services are often diffuse, invisible, probabilistic, and non-subtractable, private demand is difficult to generate.²⁶³ In theory, there is potential private demand for such traditionally public goods—e.g., flood insurance providers investing in water-storing forests²⁶⁴—but such demand has not yet materialized. Government's main role has been to require private entities to purchase mitigation. This role is vital, as demonstrated by the creation of The Climate Trust in response to Oregon's cap on carbon dioxide emissions, the DRC's groundwater mitigation bank in response to state rules requiring offsets for all new groundwater withdrawals, and creation of wetland and habitat mitigation banks. Without the imposition of mitigation requirements by state and federal agencies, markets are less likely to develop.

2. The Government as a Buyer of Services

State and federal governments can purchase ecosystem credits directly in order to meet their own conservation and mitigation objectives, thereby creating demand. Such government actions have been instrumental in developing ecosystem markets in Oregon and other states in the Pacific Northwest. The Bonneville Power Administration, through its funding of the Columbia Basin Water Transaction Program,²⁶⁵ has become the primary buyer of streamflow restoration.²⁶⁶ In doing so, it has used markets to meet its fish and wildlife mitigation obligations. ODOT has performed a similar role

262. See Neuman, *supra* note 37, at 454 (purchasing a flow meter to gauge Evan's Creek instream water right lease).

263. See John Harte, *Land Use, Biodiversity, and Ecosystem Integrity: The Challenge of Preserving Earth's Life Support System*, 27 *ECOLOGY L.Q.* 929, 951–52 (2001).

264. Salzman, *supra* note 137, at 894.

265. See *supra* Part II.B.3.

266. See HARDNER & GULLISON, *supra* note 66, at 32–35.

by using wetland and habitat banks to mitigate for the impacts of its highway and bridge construction projects.²⁶⁷ Experience to date suggests that other agencies may be able to achieve their conservation objectives cost effectively through the use of ecosystem service markets, even in situations where they are not mitigating for the impacts of their own activities.

E. Government Agencies Can Convene Market Drivers and Facilitate Market Development

Accounting systems and standards are unavailable for many ecosystem services. Even where accounting systems and standards exist, such as in wetlands mitigation, disagreements remain about how they should be applied. Little institutional capacity exists to get ecosystem markets started. Experience in Oregon and the Pacific Northwest suggests that government agencies can play the important role of convener, making sure all stakeholders are heard and that policy questions are addressed. Government agency participants can provide important scientific expertise, data, and conservation priorities to all participants. State and federal agencies have played this role in virtually all of the ecosystem service markets in Oregon and the Northwest. Their deep engagement in and commitment to the Willamette Partnership is probably the best example of this role.

Pilot programs are essential,²⁶⁸ but their usefulness is tempered if their lessons are only learned locally. EPA, the Corps, USFWS, National Marine Fisheries Services, and the Federal Highway Administration should all serve as sources of best practices, project successes and failures, and up to date scientific information. Larger governments are integrative and have a greater capacity to hire researchers, write reports, synthesize data, and transfer lessons learned from local areas to broader regions.

The Oregon Bridge Program and the Clean Water Services' NPDES permit demonstrate another key role of government agencies in ecosystem service market development. If market approaches are to be usable within existing regulatory systems, a great deal of interagency work will be needed to align requirements under various laws and regulations. ODOT and CWS were able to convene all of

267. See *supra* Part II.D.2.

268. See *supra* Part III.A.

the necessary agencies and facilitate interagency agreement on how ecosystem service markets could be used.²⁶⁹

F. Markets Can Streamline Development and Restoration

The large number of state and federal resource agencies often leads to compartmentalization, with agencies working only in their own silos and looking at only the resource they manage. State and federal agency coordination is critical to developing markets to support high priority environmental restoration. ODOT's Bridge Program demonstrates this principle especially well. Interagency coordination was not created overnight. It began with the formation of the Collaborative Environmental and Transportation Agreement for Streamlining ("CETAS") in 2001.²⁷⁰ This agreement represents a partnership of six Oregon agencies with six federal agencies actively working to improve interagency cooperation, protect the environment, and create programmatic approaches to comply with environmental statutes.²⁷¹ Within the partnership, ODOT was able to develop a Comprehensive Mitigation and Conservation Strategy that foresaw the need for performance standards, identifying mitigation obligations, finding priority restoration areas, and establishing assessment protocols.²⁷² The Federal Highway Administration's "Eco-Logical" program recommends all states engage in similar integrated planning and coordination as a prerequisite to developing other environmental programs and ecosystem service credits.²⁷³ Without clear, agreed-upon ecosystem-restoration goals, there are fewer opportunities to regulate development, to mobilize state funding, and to direct public and private sector investment. But through interagency partnership, developed at the outset, a strategic focus and priorities emerged. Only from a foundation of shared priorities and a continued commitment to consultation and participation of all stakeholders can an effective ecosystem service market emerge.

269. See Or. Dep't of Transp., CETAS Streamlining, <http://www.oregon.gov/ODOT/HWY/GEOENVIRONMENTAL/cetas.shtml> (last visited June 6, 2010).

270. See *id.*

271. *Id.*

272. OR. DEP'T OF TRANSP., COMPREHENSIVE MITIGATION/CONSERVATION STRATEGY (CMCS) WHITE PAPER 3-4 to 3-5 (2004), available at <ftp://ftp.odot.state.or.us/techserv/Geo-Environmental/Environmental/Procedural%20Manuals/Wetlands/Wetlands%20Manual/01-White%20paper.pdf>.

273. See FED. HIGHWAY ADMIN., ECO-LOGICAL: AN ECOSYSTEM APPROACH TO DEVELOPING INFRASTRUCTURE PROJECTS 9-17 (2006).

Complex agency-by-agency permitting leads to costly, time-consuming, and uncertain processes for developers, while adding to the cost and time required for restoration and other credit generating projects. This increased time leads to increased costs and uncertainty for both parties. As the Freshwater Trust discovered, a sizeable portion of restoration professionals' time is spent securing permits and funding.²⁷⁴ Credit purchasers often prefer to contribute more funds to restoration, over and above minimum mitigation requirements, in exchange for expedited, outcome based permits. This is what ODOT agreed to in the Bridge Program, and it achieved the anticipated results—better environmental outcomes with significant cost savings through expedited permitting.²⁷⁵

IV. OREGON'S LATEST ECOSYSTEM SERVICES EXPERIMENT: SENATE BILL 513

Oregon is committed to keeping up its momentum as a leader in developing ecological service markets. Experiments to date demonstrate that these markets can lead to better environmental outcomes at a lower cost to business and conservation organizations. At the December 2007 Oregon Business Summit, business and government leaders explicitly adopted an Ecosystem Services Marketplace Initiative.²⁷⁶ It seeks to build and expand markets for carbon, wetlands, habitat, open space, and hazard reduction and to develop an integrated ecosystem services marketplace.²⁷⁷ In 2008, two workshops were held in Portland to start laying the foundation for the initiative.²⁷⁸ At the first workshop, ecosystem practitioners, state government representatives, and ecosystem service experts from other states participated in a brainstorming session on desired outcomes, market barriers, roles and responsibilities of government, and policy reforms needed to stimulate an ecosystem marketplace in Oregon.²⁷⁹ A second workshop brought the results of the first workshop to state agency heads and staff who explored policies and action strategies needed to bring the integrated marketplace to

274. FRESHWATER TRUST, *supra* note 158, at 6.

275. GAINES & LURIE, *supra* note 128, at 44–46.

276. See OR. BUSINESS PLAN, CREATING AN ECOSYSTEM SERVICES MARKETPLACE (2007), available at <http://www.oregonbusinessplan.org/pdf/EcosystemServicesMarketplace.pdf>.

277. *Id.* at 1.

278. INST. FOR NATURAL RES., *supra* note 95, at i.

279. *Id.*

fruition.²⁸⁰ The two workshops culminated with a report, “Policy Cornerstones and Action Strategies for an Integrated Ecosystem Marketplace in Oregon,” recommending Oregon legislation to further the development of Oregon’s ecosystem marketplaces.²⁸¹

The 2009 Legislative Assembly took the bold step of affirmatively recognizing ecosystem services by passing Oregon Senate Bill 513 (S.B. 513).²⁸² S.B. 513 declares it “the policy of the state to support the maintenance, enhancement, and restoration of ecosystem services throughout Oregon, focusing on the protection of land, water, air, soil, and native flora and fauna.”²⁸³ The bill anticipates that valuing ecosystem services will help landowners diversify their incomes and help Oregonians enjoy enhanced health and quality of life.²⁸⁴

S.B. 513 “encourages” state agencies “to adopt and incorporate adaptive management mechanisms” and to “use ecosystem services markets as a means to meet mitigation needs.”²⁸⁵ The act requires that “[w]hen a state agency adopts a strategy or a decision that calls for the mitigation of potentially adverse environmental consequences, [it] must consider mitigation strategies that recognize the need for biological connectivity and appropriate mitigation.”²⁸⁶ Neither “biological connectivity” nor “appropriate mitigation” are defined in the Act,²⁸⁷ and agencies are not explicitly directed how or when to weigh these factors. But it is significant that the legislature has empowered and encouraged all Oregon agencies to consider ecosystem services approaches and adaptive management.

Recognizing that developing ecosystem services markets will take ongoing efforts by many agencies, non-profit organizations, and

280. *Id.*

281. *Id.* at 22–25.

282. S.B. 513, 75th Leg. Assemb., Reg. Sess. (Or. 2009). This bill was sponsored by Oregon State Senators Devlin and Atkinson and Oregon State Representatives Garrett and Gilliam and signed by Governor Kulongoski; it was proposed by Defenders of Wildlife and was supported by the Willamette Partnership, Oregon Homebuilders Association, The Nature Conservancy, Oregon Forest Industries Council, Oregon Business Council, Ecotrust, Sustainable Northwest, Wildlands Inc., Parametrix, Clean Water Services and the City of Portland. Sara Vickerman, *Ecosystem Markets Legislation: Oregon Approves Path-Breaking Legislation*, 449 OR. INSIDER 17 (August 2009), available at <http://www.oregonwaterquality.com/Insider%20Issues%20449-452.html>.

283. Or. S.B. 513 § 2.

284. *Id.* §§ 3(1), (4).

285. *Id.* § 4.

286. *Id.* (emphasis added).

287. *See id.* § 1 (defining terms).

businesses, and that more research is needed to make ecosystem service markets work well, S.B. 513 directs the Oregon Sustainability Board to convene an “ecosystem working group.”²⁸⁸ This working group is composed of representatives from local, state, and federal agencies; Indian tribes; conservation organizations; developers; and landowners from the private sector who are “active in improving the ecological effectiveness of ecosystem services markets”²⁸⁹ and will prepare a report and policy recommendations for the 2011 legislature.²⁹⁰ Specifically, the working group is expected to suggest to the legislature overarching goals for ecosystem service markets, methodologies to quantify ecosystem goals, ecological evaluation and accounting systems, the appropriate role of government participation, and the regulatory and voluntary policies required to stimulate demand for ecosystem services payments.²⁹¹

S.B. 513 represents the start of the next phase of Oregon’s experimentation in ecosystem service markets. It convenes all the different players in market development to address past barriers to market development and figure out how to develop integrated markets. It goes beyond policies of “no net loss” to recognize that some degraded ecological systems need restoration.²⁹² S.B. 513 recognizes some of the greatest challenges facing policy makers, from establishing consistent methodology standards²⁹³ to the appropriate role of government participation.²⁹⁴ Explicit recognition of these policy issues also demonstrates an understanding of just how much needs to be done—in law, science, economics, and policy—and just how great the opportunities are for ecosystem service markets’ growth.²⁹⁵

V. CONCLUSION

States can play an important role in ecosystem service market development. Oregon’s experience in the 1990s with markets for

288. *See id.* § 5(1)(a).

289. Or. S.B. § 5.

290. *Id.*

291. *Id.* § 5(2).

292. *See id.* § 2.

293. *Id.* § 5(2)(c).

294. *Id.* § 5(2)(e).

295. The ongoing efforts of the ad hoc and working groups can be seen on the Oregon Watershed Enhancement Board’s website. Senate Bill 513 Ecosystem Services Markets Working Group, <http://oregon.gov/OWEB/SB513.shtml> (last visited Jun. 23, 2010).

carbon offsets and instream water rights laid the foundation on which the Willamette Partnership and The Freshwater Trust have developed more comprehensive, market-based environmental restoration approaches. S.B. 513 institutionalizes Oregon's commitment to continued experimentation and pioneering efforts. Future success will depend upon continued collaboration between private organizations and state and federal agencies to create the institutional capacity to support market-based methods. To assure a robust marketplace that functions to the benefit of the environment and humanity, the government must assure clear standards, accountability, and scientific and technical expertise are provided to participants in ecosystem services markets.